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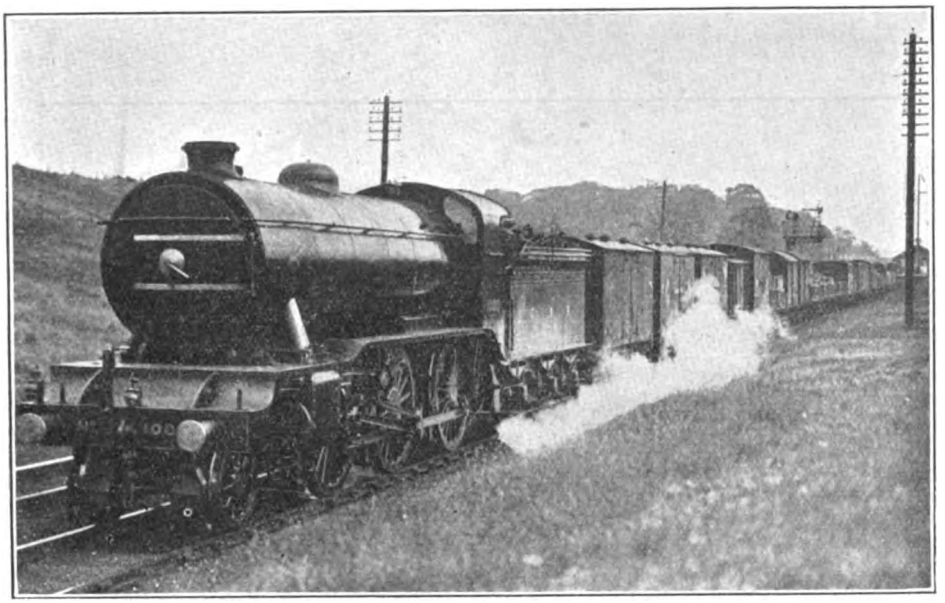

Photo.] GREAT NORTHERN RAILWAY. [*F. E. Mackay.*

Three-Cylinder Superheater 2-6-0 locomotive No. 1000, on 75-wagon through goods train.

New 3-Cylinder 2-6-0 Locomotive No. 1000, Great Northern Railway.

By CHAS. S. LAKE, A.M.I.Mech.E.

REFERENCE was made in the April RAILWAY MAGAZINE to the new 3-cylinder 2-6-0 type locomotive No. 1000, which was placed in service in March last on the Great Northern Railway, a short illustrated description of this engine being then given.

This engine is illustrated by the colour plate with this issue, and is also shown by other views reproduced. The photograph which appears on this page was specially taken by Mr. F. E. Mackay, the engine being engaged on one of the duties for which it is expressly designed, that of hauling long through goods trains on difficult schedules.

The writer was privileged to be present on the occasion of the steaming of this locomotive at Doncaster and is indebted in this matter to Mr. H. N. Gresley, the company's chief mechanical engineer, by whose kindness he was afforded special facilities for inspecting the engine under privileged conditions. The new locomotive is noteworthy for several reasons, not only as regards Great Northern Railway practice, but also when viewed on the wider ground of British locomotive standards generally. It is, so far as the writer is aware, the first 3-cylinder engine of the 2-6-0 type; its boiler is of exceptional size in respect of diameter, and contains the largest superheater yet applied in this country. The construction of the engine was explained in some detail to the writer by Mr. Gresley and an inspection of the patterns and cylinder castings was made in the foundry at Doncaster.

The outside cylinders are inclined at 1 in 30, and the inside cylinder at 1 in 8½. The piston valve steam chests of the outside cylinders are above and those of the inside cylinder at the side of the ports, all three steam chests being in the same transverse plane. The outside cylinders are at a lower level than the inside one,

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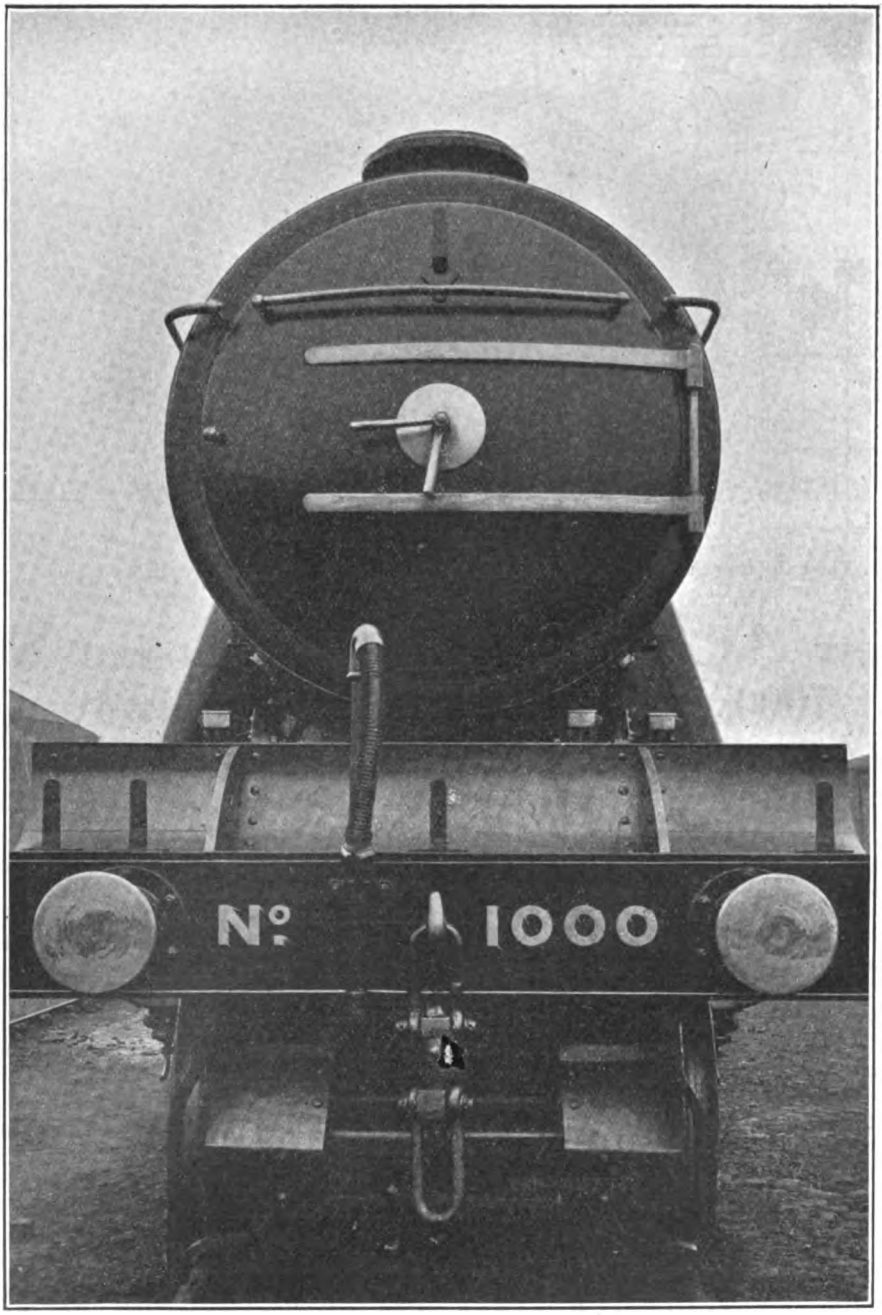

FRONT VIEW OF LOCOMOTIVE No. 1000.

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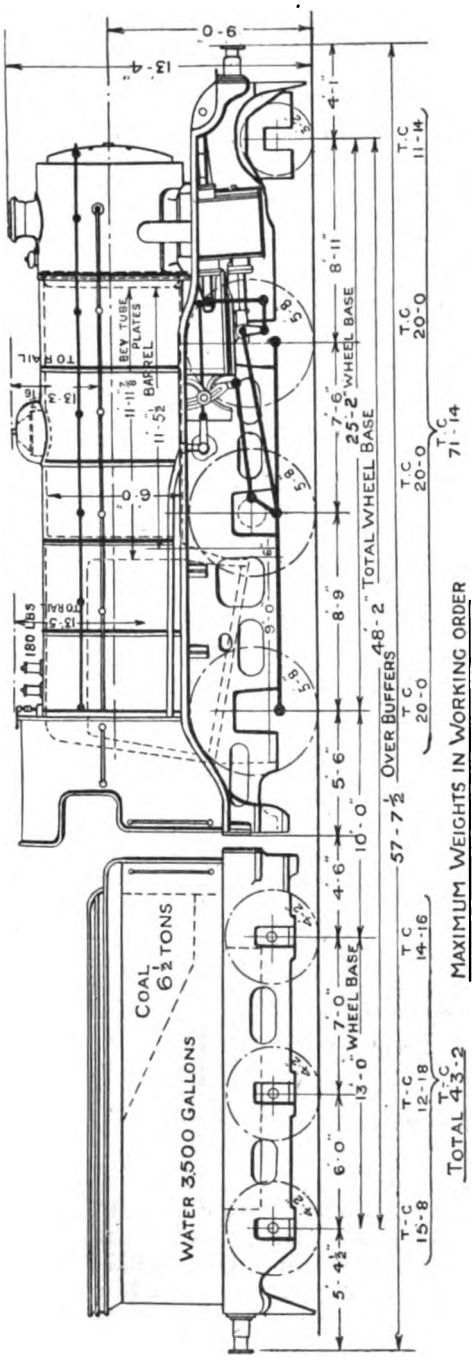

the steeper inclination of which latter is, of course, necessary to allow of clearance between the connecting-rod and the front axle. Steam is distributed to the outside cylinders by Walschaert's valve motion direct, and to the inside cylinder by a simple system of rocking levers connecting the outside valve spindles and that of the inside valve. Skefko ball bearings are used for the return crank-pin. The cylinders have a diameter of 18½ in. and a piston stroke of 26 in., a tractive force of over 30,000 lb. being exerted. The adhesion weight is 60 tons and a factor of 4·5 is obtained. In working order the engine without tender weighs 71 tons 14 cwt., and with the tender 114 tons 16 cwt. The individual axle loadings and general weight distribution are shown on the dimensioned diagram reproduced on this page, and it is interesting to note that a weight of 72 tons was estimated for without tender, the engine actually turning the scale at 71 tons 14 cwt., so that the designer's calculations were vindicated in a remarkably accurate fashion.

In planning this locomotive the object aimed at was the provision of a more powerful unit on a given weight basis and length of wheelbase. In this connection it is interesting to compare No. 1000 with the two-cylinder larger-boilered class of 2-6-0 type engine on the same line. These latter engines have a total wheelbase of 25 ft. 2 in., 53 tons 18 cwt. adhesion, and 16 ft. 3 in. rigid wheelbase. Corresponding figures for the No. 1000 engine are :—total wheelbase, 25 ft. 2 in.; adhesion, 60 tons; rigid wheelbase, 16 ft. 3 in.

Thus with the same total and rigid wheelbases the new engine has over 6 tons more adhesion, this being due to the larger and heavier boiler fitted. It is, of course, a necessary and advantageous feature in that it bears proper relationship to the increased tractive force and larger cylinder volume of the later design.

In No. 1000, with the same length of boiler but with the 6 in. increase in diameter and a 32-element superheater in place of a 24-element one, there has been obtained 324 additional square feet of heating surface, including that of the superheater. The added power of the new engine is cheaply obtained when considered on the weight basis alone, the

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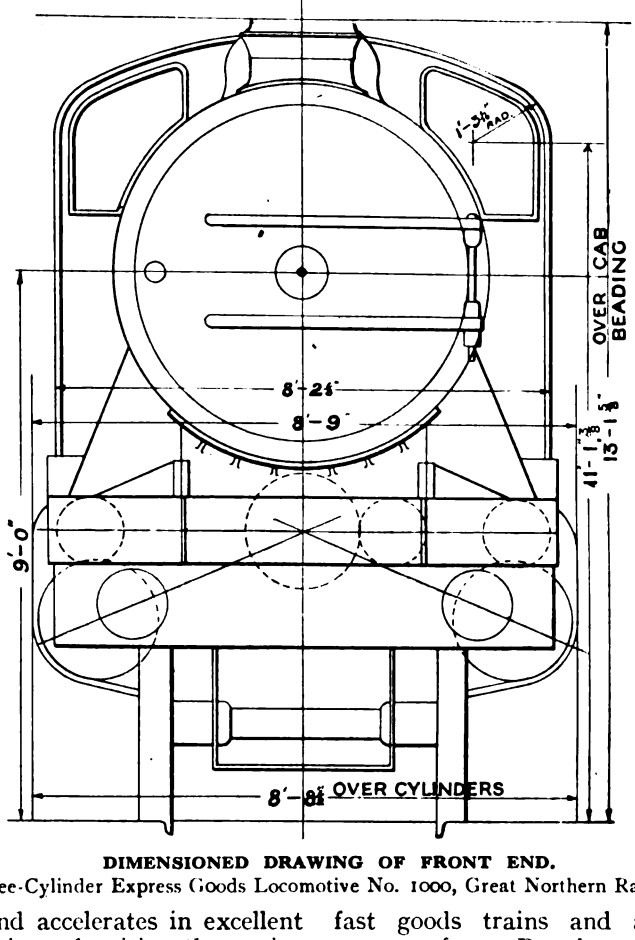
difference in the total weight of the two types being represented by a little over 7 tons, the comparison being even more favourable if restricted to adhesion weight alone.

With crank-pins set at 120° apart the superior starting effort, crank axle turning moment, and torque of the 3-cylinder engine are factors which add considerably to its efficiency, and it was noted that No. 1000 engine gets away very easily with its load and accelerates in excellent style. At the time of writing the engine has not been placed in regular service but is being tried on various workings, the results so far obtained having proved very satisfactory. The work so far done has been of a diverse nature and as a brief summary of performances to date of writing the following statement provided by Mr. Gresley is of interest. "No. 1000 has worked, on several occasions, trains consisting of 80 loaded coal wagons from Doncaster to Peterborough over the loop lines, and on one occasion it took a train of 91 (equal to 100) wagons loaded with coal. This train weighed about 1,600 tons behind the tender and no difficulty was experienced in starting, or even when it was purposely stopped on a gradient of 1 in 400, three miles in length.

"The new engine has worked various fast goods trains and also the Leeds express from Peterborough to London which is due at King's Cross at 1.55 p.m. At no time during this run did the speed exceed 60 m.p.h., the engine being worked at high speeds up the banks. It ran from Peterborough to Hitchin, where it was delayed by signals, at a maximum of about 59 m.p.h., and a minimum speed of about 56 m.p.h. The train left Peterborough on time and arrived at King's



DIMENSIONED DRAWING OF FRONT END.
Three-Cylinder Express Goods Locomotive No. 1000, Great Northern Railway.

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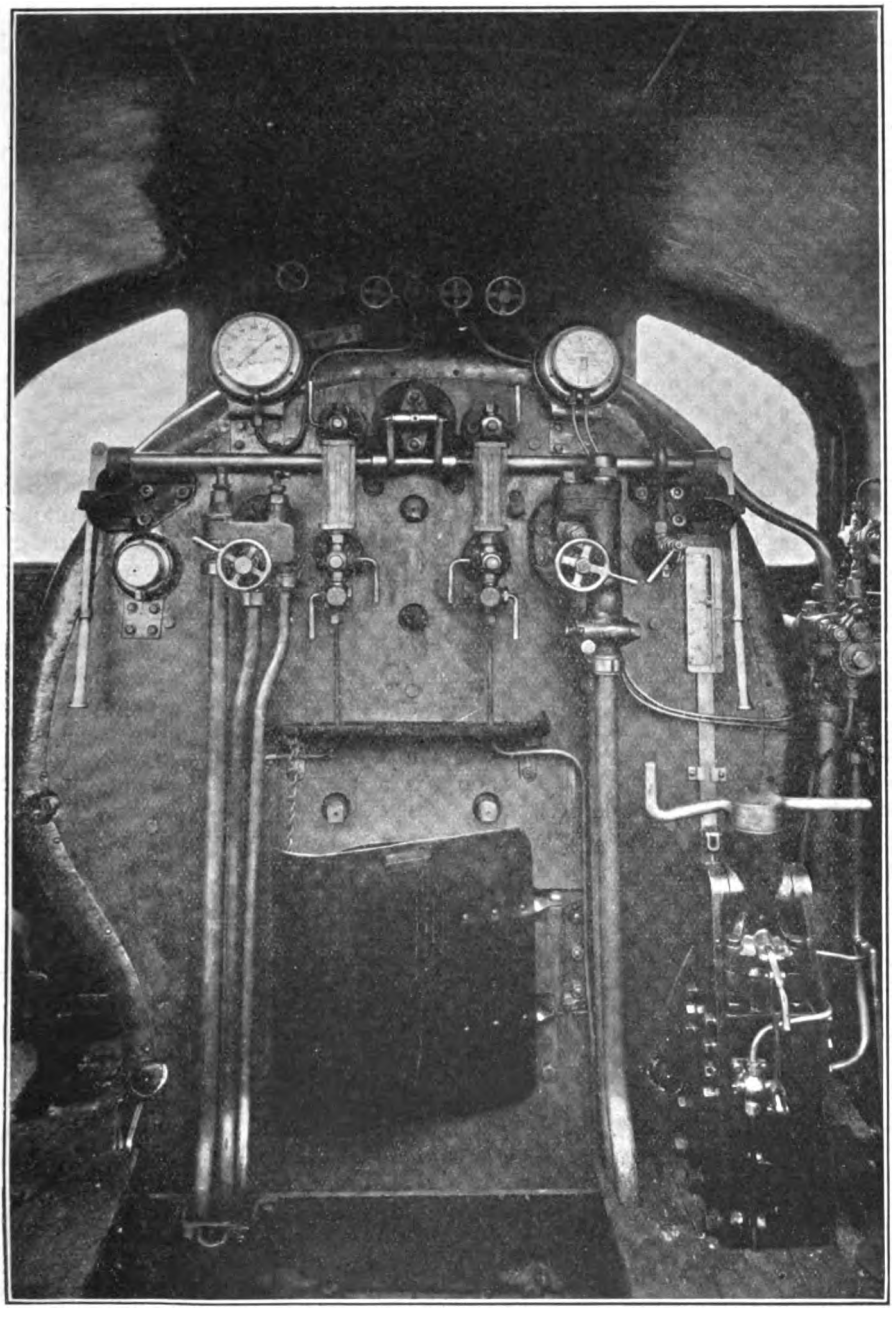

GENERAL VIEW OF FOOTPLATE FITTINGS, No. 1000, GREAT NORTHERN RAILWAY.

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Cross three minutes early. Delays by signals amounted to three minutes altogether."

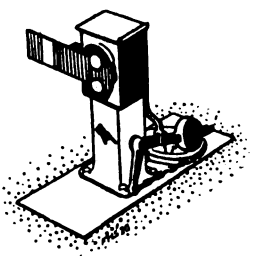
These early workings of the locomotive show most conclusively that it is capable of handling different classes of trains under widely varying conditions with apparent equal facility, thus further demonstrating the fact that the 2-6-0 type with medium size wheels is eminently well suited for dealing with mixed traffic on railways.

The cab and footplate arrangements of the No. 1000 engine are very well designed. As explained in the previous short article on the same subject, a regulator handle is provided at each side, a cross shaft spanning the full width of the firebox near the top having a handle at each end so that the regulator can be operated with equal facility at either the right or left-hand side of the cab. One's impression when riding on this engine is that the cab is of a particularly roomy kind and that in spite of the big 6-ft. boiler, an excellent view ahead is obtained through the windows at the front.

A determined and successful effort has been made to reduce the weight of the valve motion and rods by the employment of heat-treated alloyed steel, these parts having being made the object of careful study and design.

The tender is of the standard Great Northern type fitted with water pick-up apparatus. Its six wheels are 4 ft. 2 in. diam., arranged on a wheelbase of 13 ft. The water capacity is 3,500 gallons and a fuel space of 6½ tons is provided.

In these days of superheated steam and high temperatures it is necessary that locomotive cylinder castings should have uniformity of thickness and a smooth interior surface. This point has been very carefully gone into in connection with the Great Northern Railway engine No. 1000, in which a very high superheat, viz., 750 ° to 800° is aimed at. Another important matter is that of keeping the steamchest and cylinder barrel separate from one another and ribbed for strength. This method of construction provides against the evils of unequal contraction and expansion with their attendant risk of bringing about fracture of the cylinder casting. This trouble was often met with in superheater locomotives at first, and, as goes without saying, it is one of those things which must be guarded against as strictly as possible. The provision of straight steam and exhaust passages, particularly the latter, is another very important point, and this has been very carefully worked out on the new engine.



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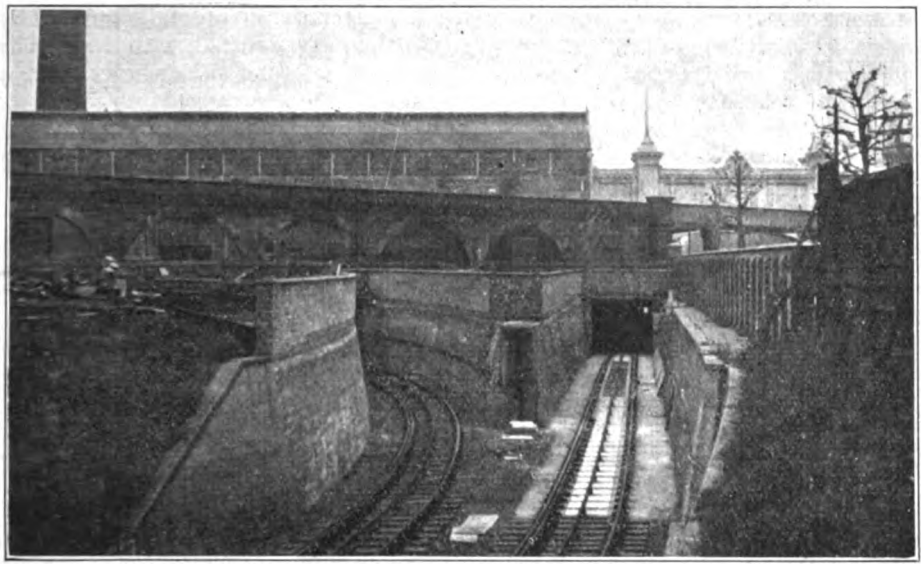

Photo.] [*J. F. Gairns.*

DOWN (LEFT) AND UP (RIGHT) LINES CONNECTING EALING & SHEPHERD'S BUSH RAILWAY WITH CENTRAL LONDON RAILWAY.

Part of Shepherd's Bush Power Station (C.L.R.) and entrance from Wood Lane Station to the "White City" are shown in the background.

The Ealing and Shepherd's Bush Railway.

By J. F. GAIRNS, M.I.Loco.E.

LORD ASHFIELD recently expressed the opinion that future railway development would largely involve the connection of tube and underground lines with surface railways in order to facilitate the distribution of passengers from the various suburban areas throughout the business and industrial areas of great cities, as distinct from the concentration necessarily associated with the great terminal stations. This view accords with the probabilities of years to come, and several of the new railway links constructed during recent years, or for which Parliamentary powers are now being sought, indicate the realisation of this aspect of London's transportation requirements.

At present only two such connecting links have been constructed, and both represent the completion of projects which date back to the pre-war period. One has been carried to completion—the connection between the London Electric and the London and North Western Railway at Queen's Park, whereby through running of electric trains between Watford and the Elephant and Castle has been in force for some considerable time, with distinctly satisfactory results. The other, the subject of the present article, though most of the construction work had been finished before August, 1914, was not completed for various reasons during the war period, though its tracks were utilised to ease other lines for milk and special goods traffic, and the final equipment has only been taken in hand since the cessation of hostilities.

Originally projected as far back as 1905, the Ealing and Shepherd's Bush Railway is designed to enable through trains to be run between the Central London Railway and the western districts of the Metropolitan suburban area served by the Great Western Railway. Its value will be very great, for it will give residents in the Ealing and Acton districts an alternative to the existing routes, and will inciden-

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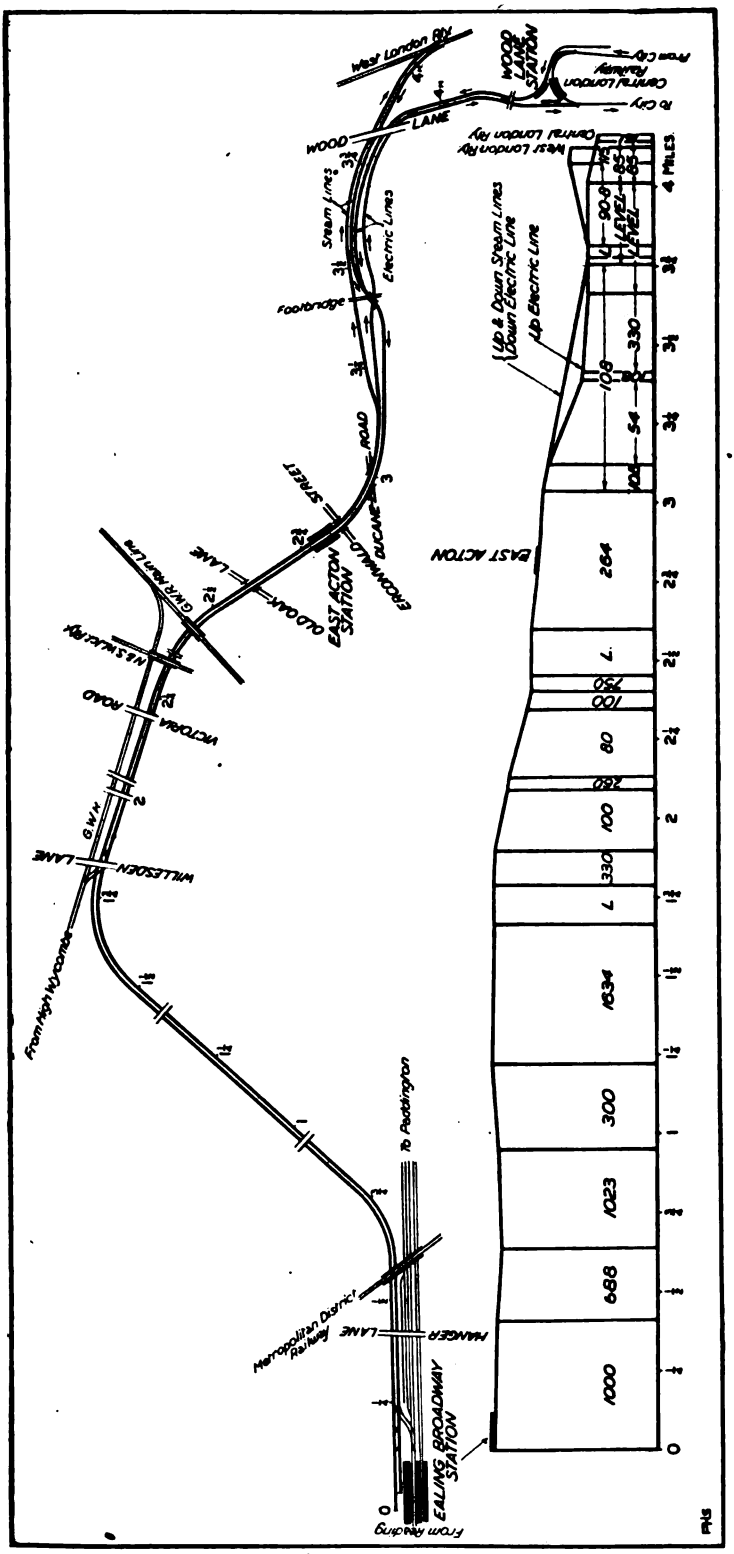

TRACK PLAN AND GRADIENT PROFILE, EALING & SHEPHERD'S BUSH RAILWAY.

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tally enable workers in the City and other business areas of Central London to travel direct to stations situated upon a route which extends almost diametrically across London from west to east.

The existing Great Western and Metropolitan route takes a more northerly course to reach the city, while Metropolitan District services pass further to the south, but the new line will provide for direct communication from Ealing and Acton through the heart of Central London. In a sense, the new facilities to be provided by this line will be competitive; but London's transportation needs are sufficiently acute to call for all practicable facilities, while the new line will also assist the opening up of certain areas in the western suburbs which are yet far from fully developed.

The Ealing and Shepherd's Bush Railway also has a further value in that, in addition to through facilities in conjunction with the Central London Railway, it provides an alternative for goods and special traffic from the West London Railway to the Great Western Railway main line at Ealing Broadway and to the High Wycombe route to the north, avoiding the surface connections at West London Junction. In addition, it is by no means improbable that in due course electrical working may be extended beyond Ealing, while as the relatively sparsely populated Park Royal and Greenford districts develop it will be a simple undertaking to give them also the benefit of through services to and from Central London.

At Wood Lane the Central London Railway has already emerged from its low level "tube" location, and a few hundred yards of new construction enable connection to be made, on gradients which are not unduly severe, from the loop to the Ealing and Shepherd's Bush Railway proper, in shallow cutting. Owing to the arrangement of the "tube" lines this connection is made by means of separate curves which bring the up and down lines together reversed from the usual disposition associated with standard left-hand running, and this continues until passing under the Wood Lane main road. This section involves a rise at 1 in 85 to the Wood Lane bridge, where a short branch, 68 chains in length, comes in alongside from the West London Railway.

In order to keep the gradients of reason-

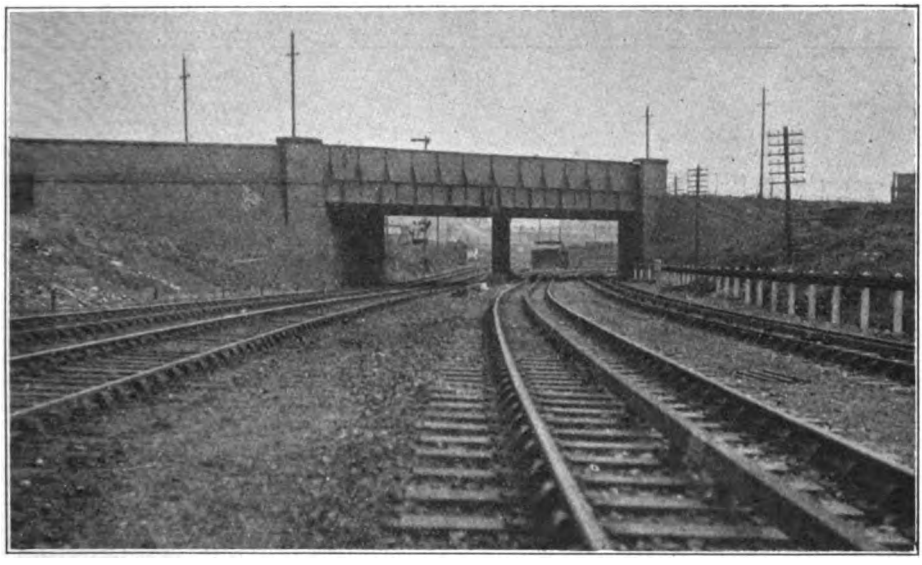

Photo.] [*J. F. Gairns.*

WOOD LANE BRIDGE, LOOKING TOWARDS WOOD LANE STATION.

Taken from the foot of the "flyover." Order of tracks, left to right, is: up to West London Railway, down from West London Railway, down from Central London Railway, up to Central London Railway.

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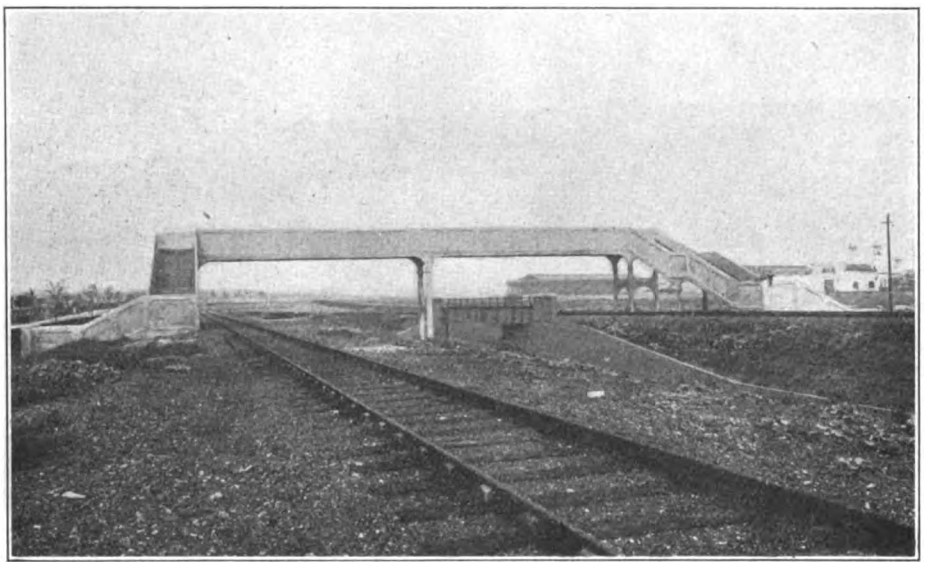
able severity, and in view of the existence of a L.C.C. main sewer below, one of the incidental works involved by the construction of the new line was the temporary diversion of Wood Lane and its reconstruction with altered gradients to give sufficient headway below, by no means a small undertaking as this is a wide main thoroughfare carrying electric tramways as well as a constant stream of motor omnibuses and general road traffic.

Passing under Wood Lane bridge the four tracks of the new line are disposed thus: Central London up, Central London down, West London down and West London up. Here commences the most interesting feature of the whole line, the ingenious system of flying and burrowing junctions whereby non-conflicting junctions are made between the West London and Central London tracks and at the same time the two latter lines are reversed in order to obtain the usual relation between up and down lines.

The junctions are comprised within a little more than a quarter of a mile, extending from Wood Lane bridge to a point a short distance beyond Wormwood Scrubbs prison and associated premises, immediately in front of which the new line passes.

As will be seen from the diagrams reproduced, both down lines continue to ascend together on a gradient of 1 in 108, while the West London up line has the same gradient, though it diverges from the former to allow of a cutting between, wherein the Central London up line (which has continued on a grade of 1 in 330 to pass under the down lines near their point of junction) ascends by an incline at 1 in 54 (in favour of the direction of running) to complete the required connections. About midway, all lines are spanned by an interesting ferro-concrete footbridge, on the Hennibique system, designed by Messrs. L. G. Mouchel and Partners, Ltd., this structure being immediately in front of the main prison premises.



FERRO-CONCRETE FOOTBRIDGE OPPOSITE WORMWOOD SCRUBBS PRISON.

Showing up West London line, and the "flyover" carrying down lines over the up electric line to the Central London Railway.

A short distance beyond the point where ordinary two-track construction commences, Ducane Road is crossed by a girder bridge having a skew span of 120 ft., and the first station, the only one to be erected as yet, is here reached, known as East Acton. This is of "halt" type, with plain timber platforms 300 ft. long and small shelters, with a red brick booking

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office below in Erconwald Street connected by stairways. It is convenient not only for a number of houses already erected in the vicinity, but for a garden suburb which is being created by the London County Council.

It may here be noted that all underbridges are prepared, as regards abutments, &c., with a view to future widening to four-tracks, while all over-bridges are constructed to give space for four lines, though two only may be at present laid.

Continuing on easier grades Old Oak Lane is crossed, and near the 2½ mile post the Great Western main line is passed under. This involved girder bridges for seven tracks above and four tracks below, and was therefore by no means a simple undertaking. The abutments were constructed wider than required, thus incidentally providing for the addition of further main line tracks when necessary, and the outer portions of the new girder bridges erected outside the high level roads. Certain lines were diverted on to others while work on the central portion was proceeding, and the outer sections then moved bodily into place to restore the original track locations. This procedure was adopted on each side of the main line.

The next half mile includes a succession of overhead structures. First is a light erection carrying the electric cables from Park Royal power station to Old Oak Common sub-station, which serves the new line, a plain red brick erection on the bank above the railway. Next is a high girder bridge carrying the North and South West Junction Railway over both the new Wycombe line, which here comes in alongside but at higher level, and the new line.

Ascending on a gradient of 1 in 80 Victoria Road is then passed under, and provision is made for the construction of an interchange station with the High Wycombe line should that be found desirable in the future. A feature of this incline at 1 in 80 is the erection of a guard structure, in conjunction with catch points on the down line, for protecting the electrical cables alongside in the event of a breakaway derailment. At this point it was necessary to lower a main sewer, and alongside Victoria Road bridge a special electric pumping plant had to be provided in conjunction therewith.

Easing to 1 in 100, two road bridges are passed under, and just beyond the

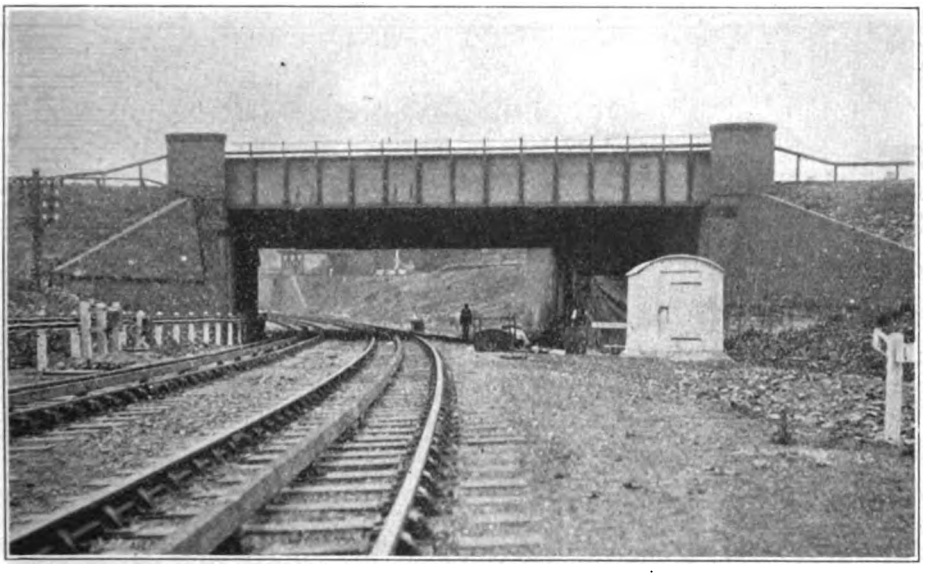

Photo.] [*J. F. Gairns.*

GIRDER BRIDGE CARRYING GREAT WESTERN RAILWAY MAIN LINE OVER EALING & SHEPHERD'S BUSH RAILWAY.

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bridge carrying Willesden Lane over the railway, connection is made with the High Wycombe line, a new signal cabin being here provided to control the junction.

Curving away from the High Wycombe line the Ealing and Shepherd's Bush Railway then continues in shallow cutting for nearly three-quarters of a mile, passing under two neat ferro-concrete bridges designed by Messrs. L. G. Mouchel and Partners, Ltd., until the Great Western main line is approached near the point where it is crossed by the Metropolitan District Railway. Thence it continues to Ealing Broadway on the northern side of Ealing goods sidings, the widening necessitating the erection of strong retaining walls in place of the old cutting slopes.

At Ealing Broadway the new line is accommodated in the space between the Great Western and Metropolitan District stations. Connections are laid in with the Great Western relief lines, and there is also a cross-over to the District station, though this is not intended for regular running purposes. Ealing Broadway thus becomes a three-fold station, four-track steam traction in regard to the Great Western main line, centre conductor rail electric traction in the case of the Ealing and Shepherd's Bush line, and positive and negative conductor rail traction in the District station. Already an important traffic centre, Ealing Broadway will now be receiving traffic by a further route, and one may anticipate that the future will witness extensions of the practice of stopping main line trains there for interchange purposes.

To accommodate Ealing and Shepherd's Bush line trains a new platform has been built adjacent to the up relief line platform. Station buildings are being enlarged on road level, and the existing stairway widened to give free communication with the up relief platform and a small circulating area serving the new line, convenient openings being made between them. The principal new platform is 640 ft. in length, but it also has a face adjacent to the up relief platform, from which it is separated by iron railings, giving a length of 400 ft., sufficient for the average five or six-coach electric trains. As the electric trains are built low their tracks are placed at a slightly higher level than those in the main line station, so as to equalise platform heights, the Central London standard being 1 ft. 8 in., and the Great Western 3 ft. The new platform will be provided with Great Western

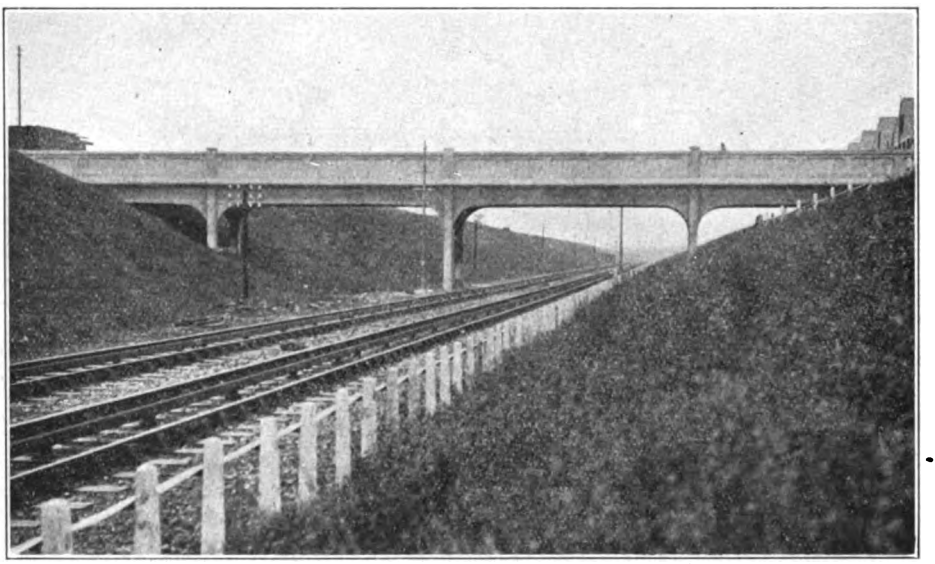

Photo.] [*J. F. Gairns.*

FERRO-CONCRETE ROAD BRIDGE IN CUTTING APPROACHING EALING BROADWAY.

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standard verandah roofing over the entire length, and a new footbridge is in process of erection which will eventually extend across all three stations—Great Western, Ealing and Shepherd's Bush and Metropolitan District.

The new railway has been built with permanent way in accordance with Great Western Railway main line standards, including bull-headed rails weighing 97½ lb. per yard, hardwood sleepers and slag ballast. Total length under Great Western Railway oversight is 4 miles 15 chains to the Central London boundary, while the West London connection adds a further 68 chains as already mentioned.

wood Scrubbs prison, bridges are usually of standard Great Western girder types carried by brick abutments, but alterations to existing bridges necessarily agree with the original erections. In some instances, as at Victoria Road, underpinning and special operations were entailed. The work involved by the Wood Lane bridge has already been mentioned, as also the fact that new and altered bridges are constructed with a view to the probable laying of four roads throughout when demanded. Drainage is of the usual type, with side ditches and pipes. Retaining walls are of brick-faced concrete.

Electrical equipment includes a centre

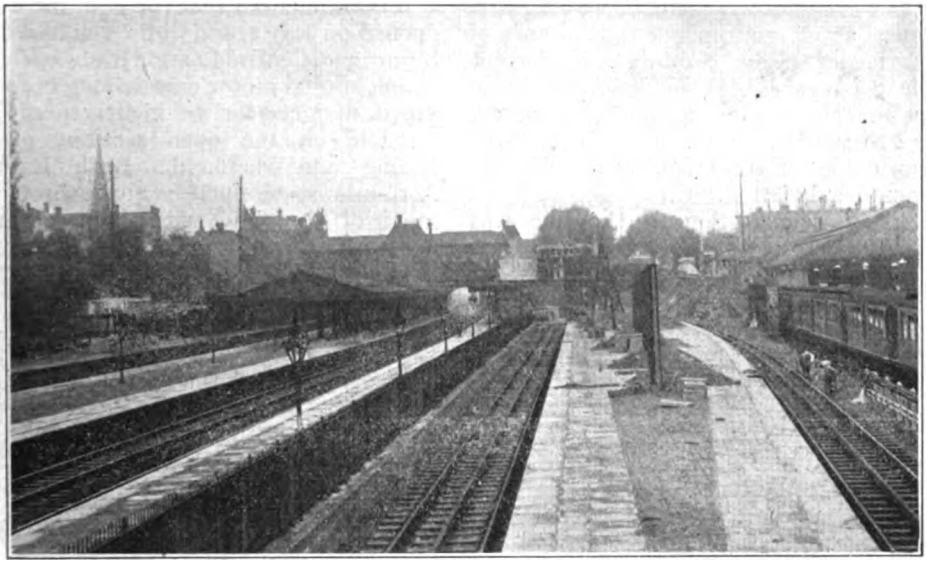

Photo.] EALING BROADWAY STATION. [*J. F. Gairns.*

Main line platforms to the left, Ealing and Shepherd's Bush platform in centre, Metropolitan District Station to right.

Construction involved the excavation of 600,000 cubic yards of earthwork, and of this 200,000 cubic yards were utilised for embankments, &c., the remainder being run to spoil at suitable places on the Great Western Railway. Most of the excavation was in clay, but a small quantity of gravel was encountered at the Ealing end.

The deepest cutting is 40 ft. near Victoria Road, and the highest bank 20 ft., near East Acton station. The standard formation for cuttings and banks is 20 ft. Apart from the two ferro-concrete road bridges and the footbridge opposite Worm-

conductor rail, with running rail return, laid by the Great Western Railway to the Central London boundary point, supplied with electricity from the Park Royal power station through the Old Oak Common substation near Victoria Road bridge. Electric cables, both for traction and signalling, are carried on concrete posts erected alongside the line and supported on malleable iron hooks.

Signalling is automatic and semi-automatic, installed by the McKenzie, Holland and Westinghouse Power Signal Company, Ltd., and is usually of the "All-Electric"

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type, but at Ealing, as compressed air was already available, it was decided to operate the points and dwarf signals on the electro-pneumatic system. All the main line signals are of the three-position type, operating in the upper left hand quadrant; there are, however, three signals reading to and from the West London line, which are of the ordinary two-position type operating in the lower left-hand quadrant. The whole of the signalling is operated on alternating current, the track-circuits being fitted with impedance bonds to allow the rails to be used as conductors for the A.C. signalling currents as well as being used as returns for the propulsion current.

Electric cables were supplied by Messrs. Siemens Bros., and include 3,580 yards of H.T. feeder cable, 7,500 yards of pilot cable, 7,550 yards of cable for supplying the signalling connections at 19 feeding points, and 220 yards of 1 in. and 220 yards of 1½ in. cable for track feeders at Old Oak Common substation.

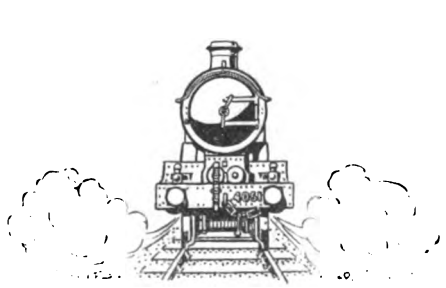
General construction of the line was carried out by Henry Lovatt and Co., of Wolverhampton, under the oversight of Mr. W. Y. Armstrong, late New Works Engineer to the Great Western Railway, and completed under Mr. W. A. Cashman, the present New Works Assistant, under Mr. W. W. Grierson, Chief Engineer. Conductor rails were laid and posts erected by the Engineering Department of the Great Western Railway,

The complete electrical installation, including the design of the special apparatus used, was carried out by the Staff under the Company's Electrical Engineer, Mr. Roger T. Smith. It may be noted that in several instances switch pillars have been constructed in concrete instead of cast iron as usual. Old Oak Common sub-station is equipped with Bruce-Peebles motor converters taking three-phase alternating current at 6,600 volts from Park Royal and supplying d.c. to the line at 600 volts. The sub-station is provided with a battery having a capacity of 700 k.w.h. at the one-hour rate. Auxiliary positive-feeder cables are laid to Ealing.

Station construction has been carried out at Ealing Broadway and East Acton by Messrs. Holliday and Greenwood, of Battersea. At Ealing Broadway the terminal roads are provided with pneumatic oil buffer stops installed by Messrs. Ransomes and Rapier, Ltd.

It is anticipated that the new line will be opened on July 1, and traffic will be worked by means of Central London Railway electric trains, special motor cars having been provided, designed for the higher speeds permissible on the open sections of the Ealing and Shepherd's Bush Railway. A 10-min. service will be given throughout most of the day, with frequent trains at other times and on Sundays. The trains will run through between Liverpool Street and Ealing.

The writer is indebted to Mr. W. W. Grierson, Chief Engineer, Mr. W. A. Cashman, New Works Assistant Engineer, Mr. J. Monckton, of the Engineer's Department and to other officers of the Great Western Railway for information utilised in the course of this article, and to Mr. J. C. Wright for very material assistance rendered during a tour of inspection over the Ealing and Shepherd's Bush Railway, a line which is destined to figure prominently in the solution of London's traffic problem in regard to the western suburban areas.



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British Locomotive Practice and Performance.

By CECIL J. ALLEN, A.M.Inst. T.

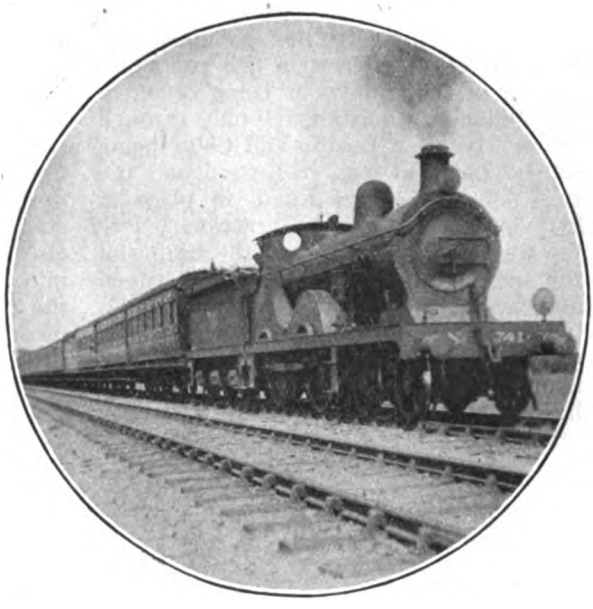

Photo.] [*F. W. Curtis.*

SOUTH EASTERN & CHATHAM RAILWAY.

Victoria-Ramsgate express. 4-4-0 locomotive, No. 741.

HEAD and shoulders above all the improvements to train services revealed in the May time-tables were those effected by the Midland Railway. Such accelerations as 80 and 85 min. in the end-to-end schedules of individual trains, at one fell swoop, almost take one's breath away, even when all allowance is made for the ravages of war. These are the amounts, nevertheless, by which the journeys of the down and up mid-day "Scotsmen" between St. Pancras and Glasgow have been curtailed, the only alteration in the stops being that Leicester is substituted for Nottingham and Sheffield in both directions. In this way the London-Glasgow time is brought within three-quarters of an hour of its pre-war figure, and that in the reverse direction within half-an-hour—a very creditable achievement. By this service a 4¼-hours train is provided in each direction between London and Leeds, which is within 5 min. of the best Great Northern time, despite a route 10 miles further and very far harder from the locomotive standpoint.

Acceleration of running times alone is responsible for cutting 50 and 53 min. respectively from the schedules of the down and up morning expresses by the same route, the Edinburgh portions being run separately *via* Nottingham. The latter arrangement is productive of new non-stop runs between London and Nottingham in each direction, the 123½ miles taking 146 min. on the down journey and 149 min. on the up. But it seems a great pity that those who prefer the Midland route for scenic or other reasons should still be precluded from using these trains between London and Edinburgh; surely the time has now come for withdrawing war-time restrictions of this character! Principal among other features of the new Midland Scottish services is the reinstatement of a second night train in each direction between London and Glasgow; the down express, at 11.30 p.m. *ex*-St. Pancras, actually races the corresponding train from Euston, although the Midland and Glasgow and South Western route is some 23 miles further, and gets to St. Enoch at 9.15 a.m., as against the West Coast 9.35 a.m. at Central.

Elsewhere on the Midland the most important innovation is undoubtedly the new East Lancashire service, and in particular the through trains between St. Pancras and Colne, with restaurant cars to and from Manchester (Victoria). This arrangement appears to indicate that a

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large proportion of the London and North Western interest in this particular quarter of the country is being ceded to the Midland authorities, the only through vehicles between Euston and Colne being run on the 5.30 p.m. *ex*-Euston and the 12.5 p.m. *ex*-London Road, in place of four expresses in each direction before the war. As yet, however, the timing of the bulk of the Midland trains between Manchester (Victoria) and the Midland line are capable of considerable improvement. For example, the through Nottingham passenger by the 4.3 p.m. *ex*-Victoria has to wait at Chinley 25 min., and does not reach Nottingham until 7.8 p.m., whereas the 5 p.m. Great Central express from London Road would bring him into Nottingham only 4 min. later. The Royston line also comes into use again as a link between the Midland and Lancashire and Yorkshire systems, and it is curious to notice the through Halifax coach on the 4.25 p.m. *ex*-St. Pancras immediately countered by the Great Central Company running a coach to the same destination on the 3.15 p.m. *ex*-Marylebone.

Considerations of space prevent me from describing in detail all the Midland alterations, but they have been productive of quite a crop of 50 m.p.h. bookings, which are set out in the accompanying table. Particular notice must be directed to the excellent bookings now in force over the northern section of the line, such a time as 90 min. from Hellifield to Carlisle, for example, being only 4 min. in excess of the best pre-war time. The good speeding-up south of Leicester is also responsible for introducing four 118-min. runs to London into the table; but the three two-hour trains in the opposite direction fall just outside the 50 m.p.h. limit, as also the 149-min. up non-stop from Nottingham and several other such runs. A slight adjustment of the timing of the 9.10 a.m. from Manchester to London, whereby the 65 miles from Wellingborough to St. Pancras are now allowed 79 min., removes the last-mentioned run from the list. The smart travelling on the West of England section will doubtless come as somewhat of a surprise to many readers, especially the 53·2 m.p.h. "snippet" from Cheltenham to Bromsgrove, where a booked stop is made for the usual assistance up the Lickey incline. It is, of course, the 2.10 p.m. from Bristol to Sheffield that is the train concerned, and it has markedly preferential treatment in the matter of speed all the way to Birmingham, all the other expresses being

Photo.] MIDLAND RAILWAY. [*K. J. Douglas.*

Nottingham–London express near Oakham. 4-4-0 compound locomotive, No. 1039.

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allowed 40 min. over this length. As regards the 28-min. time from Bromsgrove to Ashchurch, reference to a pre-war working book shows that this length was in those days, covered by a morning express in the remarkable time of 25 min., start-to-stop—a brilliant 57 m.p.h. average speed for a short journey that I had never previously noticed.

London and North Western alterations are confined mainly to the Scotch and Irish trains. A morning service is given once again between Euston and Glasgow, the 9.15 a.m. down being put forward

Similarly the 10 a.m. from Glasgow calling only at Crewe and Northampton, south of Carlisle, reaches Euston at 7.10 p.m. A stop at Northampton is curious for an up Scotch day express, and is, I believe, unique in West Coast history; Northampton, on the London and North Western Railway, and Nottingham, on the Midland, both "looped" off the principal main line, seem between them to enjoy the most constantly changing express train service of any two towns in the country of similar size. The diversion of two more of the Manchester expresses—the

MIDLAND RAILWAY.

Runs scheduled at 50 m.p.h. or over, May, 1920.

Train.	From	To	Distance. miles.	Time. min.	Speed. m.p.h.
12.31 p.m.	Appleby	Carlisle	30¾	34	54·3
3.20 ,,	Cheltenham	Bromsgrove	31	35	53·2
1.35 a.m.	Leicester	Trent Junction	20¾	24	51·9
11.05 ,,	Luton	St. Pancras	30¼	35	51·9
9.50 p.m.	Hellifield	Carlisle	76¾	90	51·2
4.51 a.m.					
2.40 p.m.					
5.00 p.m.					
3.03 a.m.	St. Alban's	Bedford	29¾	35	51·0
1.15 p.m.	Hawes Junction ..	Leeds	62¾	74	50·9
8.19 a.m.					
2.34 p.m.	Bromsgrove	Ashchurch	23¾	28	50·9
6.54 ,,					
9.15 a.m.	St. Pancras	Nottingham	123½	146	50·8
9.47 ,,	Kettering	St. Pancras	72	85	50·8
9.12 ,,	Manton	St. Pancras	90¼	107	50·6
12.28 p.m.					
3.50 ,,	Leicester	St. Pancras	99	118	50·4
5.24 ,,					
7.17 ,,					
3.20 ,,	St. Pancras	Kettering	72	86	50·2
5.34 ,,	Cheadle Heath	Liverpool	36	43	50·2
2.10 ,,	Skipton	Carlisle	86¾	104	50·0

to 9.30 a.m. for this purpose, and missing Blisworth, Preston, and all regular stops north of Carlisle. Thereby a total gain of exactly an hour is realised in running, and Glasgow is reached in 10 min. over 9 hours; one is only sorry that it was not found possible to lop off the 10 min. as well and make the journey time by this train, as by the 1.15 p.m., one of an even 9 hours. A priceless allusion to this alteration, by the way, was made by our one and only newspaper of maximum daily circulation, which gravely informed us that the Scottish express in question would "no longer run *via Liverpool*"!

2.45 p.m. down and the 2·5 p.m. up—*via* Stoke, is a very desirable change, but why should it be necessary to make the latter spin out 112 min. between Rugby and Euston, when the 2.10 p.m. from Liverpool, just behind, does the same journey in 5 min. less, with a stop at Willesden thrown in? Were the Manchester train to run up from Rugby in the "crack" 97 min. of the up afternoon "Scotsman," it would reach London in 4¼ hours from Manchester. It is difficult to understand why the 4½-hours time between Manchester and London should be subject to such rigid observance as to

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lead to running inconsistencies of this character, especially when such observance is a bar to progress in time-table reconstruction. Despite the accelerations which have taken place there are even yet very few expresses which attain to the 50 m.p.h. average between stations on the London and North Western Railway.

The principal summer alterations on the East Coast lines took effect from April 1; but to refer to them as improvements would, on the whole, be somewhat of a misnomer. It seeems distinctly unfortunate that it should have been found necessary already to "ease" the times of all the Scotch expresses (except the morning day trains in each direction) by 10 min. between London and Edinburgh, as the previous times were comparatively easy of accomplishment with the heaviest of loads, and with average loading from April to July the drivers must find it a matter of great difficulty to fill in their times. By the way, why is it an invariable rule now that both portions of the 10 a.m. down "Scotsman" must stop at exactly the same stations between London and the Scottish capital? If the 9.50 a.m. down were to stop first at Doncaster (1.5–1.10 p.m.), and next at Darlington (about 2.45 p.m.), instead of at Grantham and York, which are served by the 10 a.m. train, passengers and luggage for the important Tees-side district would catch the 3 p.m. train from Darlington, as before the war, would save over an hour on their journeys, and would have only one change of trains instead of the existing three at York, Northallerton and Eaglescliffe. This principle has been adopted on the up journey, so far as the North Eastern Company is concerned, the 10 a.m. from Edinburgh serving Darlington only to York, and the 10.15 a.m. Berwick and Newcastle; but it is capable of far more extensive adoption in the case of such duplicate expresses. The 1.20 p.m. down "Scotsman" follows the example of the 5.30 p.m. by missing York for passenger purposes; but it is very disappointing to notice no alteration of the latter train or its corresponding up express in the morning other than a start from Newcastle at the old time of 8 a.m., in consequence of the cutting out of the Durham stop. *Apropos* of my February article on the working of these expresses, I was a passenger on the up train on a

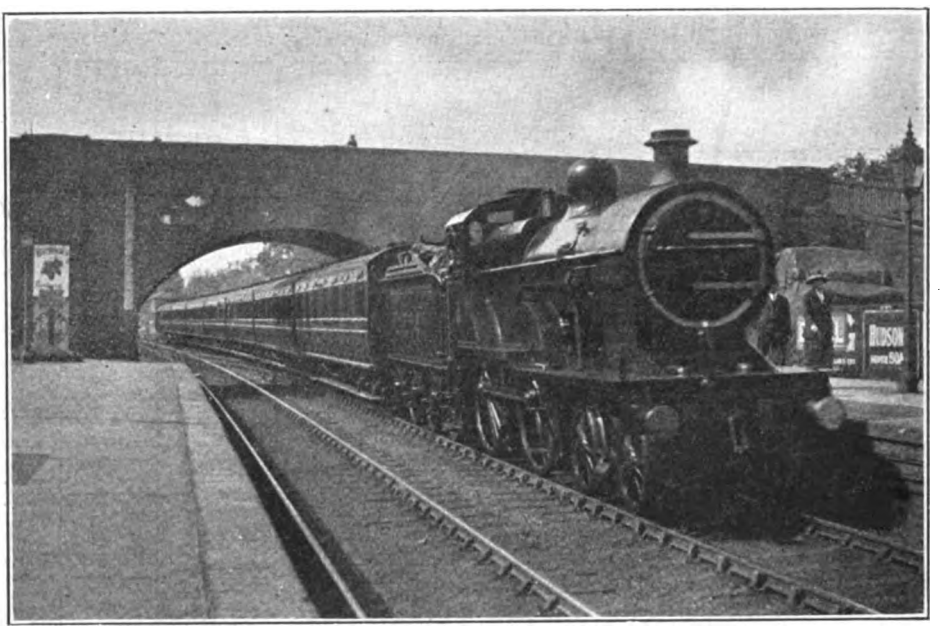

Photo.] MIDLAND RAILWAY. [*F. H. Stingemore.*

Bedford–London train entering Elstree station. 4-4-0 superheater locomotive, No. 554.

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recent Friday, when we mustered a grand total of *six* first-class passengers, with 70 seats over which to spread ourselves, or 92, if we reckon three-aside in the corridor compartments. One is glad to see the 10.10 a.m. down Leeds accelerated to 4¼ hours overall, and the 3.30 p.m. up cut to 4 hours, 10 min., thus bringing all the principal Leeds expresses down to journey times of 4 hours, 10 to 20 min.

There have been few alterations of note on the Great Western Railway, the most important being the diversion of the 7.30 a.m. from Birmingham to London *via* Bicester; this train contrives to reach London in 2½ hours despite intermediate stops at Knowle, Warwick, Leamington, Banbury, Bicester and Princes Risborough —six in all—a pretty sure indication that a cut below 2½ hours in the case of the faster one-stop or two-stop trains is now badly overdue on both routes. On the London, Brighton and South Coast Railway the principal improvements relate to Eastbourne, which now has a 90-min. train to London at 5.10 p.m., and others in 94 and 95 min. The best time from London to Brighton, however, remains 65 min., and is now by the 11.40 a.m. from Victoria, the allowance of the 5.35 p.m. down having been extended to 68 min.; the 8.35 p.m. *ex*-Victoria is a 70-min. train, with an intermediate stop at Hayward's Heath. A feature of the new London, Brighton and South Coast time-table is the extensive re-introduction of slip coaches, of which 13 are now detached daily, five at Hayward's Heath, three each at Preston Park and Polegate, and one each at Horley and Sutton.

In a northerly direction the Great Central Railway has also recommenced to "slip," the experimental coach of which I wrote last month being destined for the 6.10 p.m. down Bradford express, which has thereby been enabled to miss both Brackley (where the slip takes place) and Woodford, and to run non-stop to Leicester in 123 min. By omitting Staveley also, Sheffield is reached at 9.37 p.m., 10 min. earlier. On the Lancashire and Yorkshire line the chief innovation is the re-introduction of a Liverpool-Hull through service in connection with the Zeebrugge boats; the east-bound train, at 2 p.m. from Liverpool, runs non-stop from Manchester to Brighouse, as in pre-war days, and the

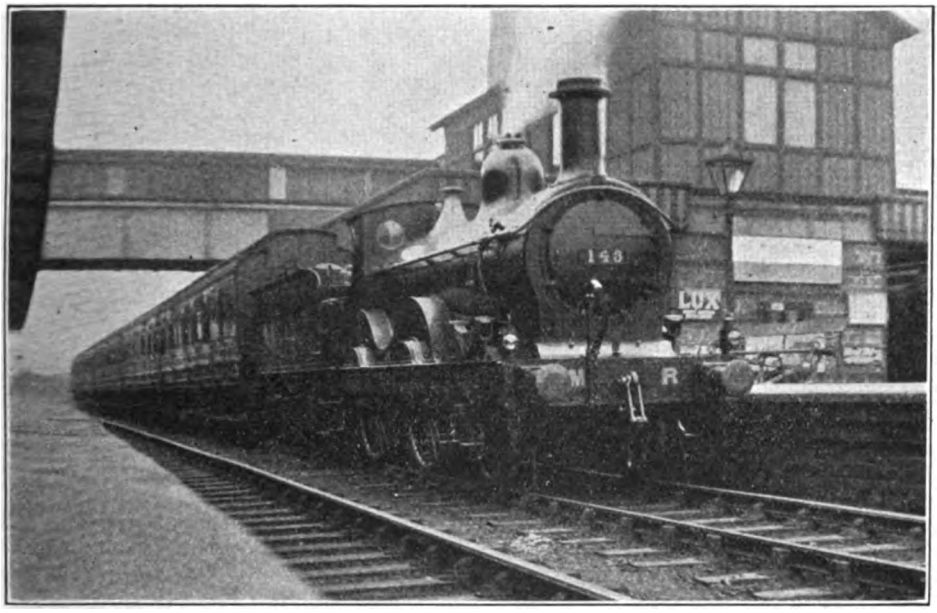

Photo.] MIDLAND RAILWAY. [*R. D. Pollard.*

Manchester–Buxton train at Chinley. 2-4-0 locomotive, No. 143.

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return train from Wakefield to Todmorden.

Very few of the numerous Caledonian alterations involve any increase in the running speed of the trains, the only notable exception being the 10 a.m. from Glasgow to London, which is now booked from Symington to Carlisle, 67 miles, in 78 min., average 51·5 m.p.h. In Ireland all the honours must go to the Great Northern Railway, with a fine programme of improvements. Of these the chief relates to the heavy 3 p.m. express from Dublin to Belfast, whose time has now been cut down to the even 2½ hours of the "Limited Mails." This has been done in virtue of the replacement of the stops at both Drogheda and Goraghwood by "slips," the 54¼ miles' run from Dublin to Dundalk, with the Drogheda slack, being performed in 64 min., at an average speed of 50·9 m.p.h. In addition three trains cover the 31¾ miles between Dublin and Drogheda in 38 min., two run the 22½ miles between Drogheda and Dundalk in 27 min., and five trains run from Portadown to Belfast, 25 miles in 30 min. —an average in all 10 cases of exactly 50 m.p.h., and a very creditable showing indeed. The fastest run, however, is from Adavoyle down to Dundalk, by the 7.30 a.m. from Belfast, the 8¼ miles being covered in 9 min., average 55 m.p.h. There are many further comments which I should like to have made on the important changes embodied in the May time-tables, but considerations of space forbid.

In order to be as topical as possible in the matter of performance I have lost no time in sampling the accelerated Midland services, and wish now to detail the results of my observations. I have travelled by both the 9 and 11.45 a.m. "Scotsmen" to Carlisle, and will take these two journeys first. Out of St. Pancras we had tare loads of 198 and 186 tons respectively, and of 210 and 195 tons full, hauled in both cases by 4-4-0 compound No. 1031. On the former run we were hampered by a particularly violent west wind, but with all allowances for this the second was by far the better trip. Banked in rear out of the terminus in both cases, we passed Hendon, 7 miles, in 12¾ min. and 11 min. 25 sec., at 53 and 60 m.p.h.; Elstree, 12½ miles, in 20¼ and 18 min., at 38½ and 48 m.p.h., touched 65 and 69 m.p.h. at Radlett, and were through St. Albans,

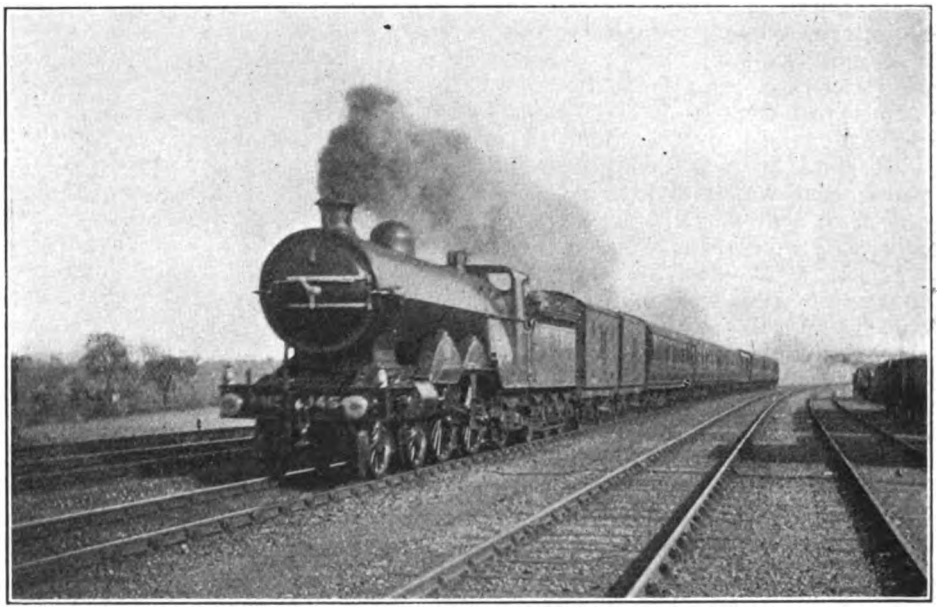

Photo.] GREAT NORTHERN RAILWAY. [*R. Hall.*

Down express drawn by 4-4-2 superheater engine, No. 1454.

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20 miles, in 28 min. 25 sec. and 25½ min. Luton, 30¼ miles, was passed in 39 min. 50 sec. and 36 min. 35 sec. (in the latter case 1½ min. early); the 11½ miles on to Ampthill occupied 11 min. 10 sec. and 10 min. 35 sec., with maxima of 75 and 72½ m.p.h., and the 8 miles thence to Bedford, 7 min. 25 sec. and 8¼ min., a bad signal check occurring on the second run on this length. From Bedford, passed in 58 min. 25 sec. and 55 min. 25 sec., the 10 miles to Sharnbrook Summit (59¾ miles), were run in 13 min. 10 sec. and 12 min.—minimum rates 32 and 29 m.p.h.—and the 5 miles on to Wellingborough, 5 min. 40 and 25 sec., the 65 miles from town having occupied 77¼ min. and 72 min. 50 sec., or 72¼ min. net in the latter case. On the first trip we had thus just kept time, but on the second had gained over 4 min., delay included, and it was not, therefore, surprising that we were brought on the latter run to a dead stand for signals at Finedon, 68¼ miles from London, in 77 min. 35 sec., or about 75½ min. net from the start. So, after standing 3¾ min., it took us 87¾ min. to pass Kettering on this occasion; but then we again did some fine work, running the 6½ miles up to Desborough in 8 min. 20 sec., with a minimum of 43 m.p.h., the 5 miles on to Market Harborough in 4½ min., attaining 72½ m.p.h., and then slacking to 30 through the station, the 5¾ miles on up to Kibworth in 7¾ min.—minimum 40 m.p.h.—and the final 10¼ miles to Leicester, including a slack over Wigston Junction, in 11¾ min.—total, 120¾ min. from London. But the net time for the 99 miles from London was not more than 112 min. at most. On the first run the work fell off badly after Kettering, as we dropped to 29 m.p.h. on Desborough bank, and took 102 min. 40 sec. to Harborough and 124 min. 25 sec. to Leicester.

No. 1031 continued to haul the 9 a.m. down as far as Leeds, but on the 11.45 we exchanged this engine for a 4-4-0 of class "3," whose number I omitted to note. We passed Loughborough, 12½ miles, in 15¾ min. and 14 min. 55 sec., at 60 and 67 m.p.h., the start in the latter case being excellent. No. 1031 reached Trent Junction, 20¾ miles, in 25 min. 50 sec. (schedule 24 min.), whereas the class "3" engine passed that place in 23 min. 40 sec., at 30 m.p.h. There are now worse hindrances than ever to fast running between Trent and Chesterfield, owing to pitfalls; on the first run we had two slacks to 15 m.p.h. and two to 20, so that we took in all 49½ min. start-to-stop for this 26¼ miles, instead of the 44 min. allowed. On the second run the slacks were less severe, but the running was also much better, and the same distance occupied 40 min. 25 sec., passing in each case, 42 min. being allowed. After Chesterfield No. 1031 did at last make some effort to regain arrears, and so passed Rotherham, 16 miles, in 18 min. 50 sec. (slacking there to 35 m.p.h., after touching 68 at Killamarsh), Cudworth, 29 miles, in 34¾ min., and Normanton, 39 miles, in 48 min. 10 sec.; but for a p.w.r. check near Hunslet we should probably have completed the 51¾ miles from Chesterfield in 62 min. As it was we took 64 min. 5 sec. instead of the 65 min. allowed. On the second occasion we took matters very easily after Chesterfield, and passed Normanton 113 min. 25 sec. after leaving Leicester; the same check then made us take 131 min. 5 sec. to Leeds, or 1 min. over schedule time. But with a clear road we could easily have gained 5 min. by smarter travelling over this concluding length.

North of Leeds we attached on the first run No. 991, of the non-compound class "4" series, for the run to Carlisle. With unaltered load we passed Apperley Bridge, 7½ miles, in 11 min. 50 sec., slacked to 40 m.p.h. over Shipley curve, got through Keighley, 17 miles, in 24 min. 20 sec., and reached Skipton, 26 miles, in 34½ min. Re-starting, we maintained a minimum of 35½ m.p.h. up Gargrave bank (the steepest part of which is at 1 in 130), and passed Hellifield, 10 miles, in 16 min. 5 sec., and Settle Junction, 13¼ miles, in 19 min. 20 sec., at 67 m.p.h. The hardest part of the climb to Ais Gill commences at this point, and continues, at an average of about 1 in 100, as far as Blea Moor box; this 14 miles took us 23¾ min., the wind catching us with gale force on the exposed length of line above Ribblehead. Up till then we had not fallen below 31 m.p.h. The "tableland" of 11¼ miles from Blea Moor to Ais Gill was run in 13 min., speed rising to 66 m.p.h. at Hawes Junction; after that

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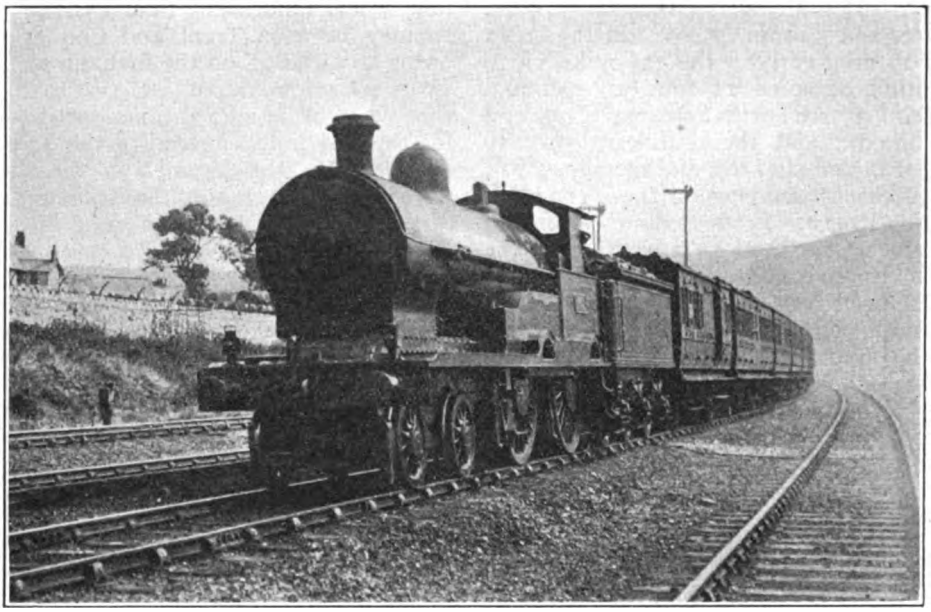

Photo.] LONDON & NORTH WESTERN RAILWAY. [*W. H. C. Kelland.*

North Wales train near Llandudno Junction. 4-4-0 superheater engine, No. 361, "Beagle."

we ran very moderately downhill, the 17½ miles from Ais Gill to Appleby taking 17¼ min., the 15¼ miles thence to Lazonby 14 min. 40 sec., and the last 15½ miles into Carlisle 17 min. Speed at no point exceeded 70 m.p.h., and was frequently checked; on the short rise after Armathwaite we fell to 51 m.p.h. Total time from Skipton to Carlisle was thus 105 min. for the 86¾ miles, or 1 min. over schedule.

On the second journey No. 479, class "2," re-built superheater, piloted No. 995 from Leeds to Hellifield, and the run with so light a load was, therefore, of little interest. Re-starting from a signal stop just outside Wellington we covered the 36 miles in 46 min. 55 sec., slacking to 34 m.p.h. at Shipley, and attaining 61½ m.p.h. beyond Keighley. I have also had another run on this train north of Hellifield, with an identical load, hauled by No. 997 of the 999 series. Both trains took the same time of 4 min. 50 sec. for the initial 3¼ miles to Settle Junction, and attained the same speed of 67 m.p.h there. But No. 995 bettered the working time of 23 min. thence to Blea Moor by 5 sec., not falling below 33 m.p.h., whereas No. 997 fell to 32 and took 24 min. 10 sec. From Blea Moor to Ais Gill the times were 13½ and 13¾ min., with maxima of 61 m.p.h. at Hawes Junction in each case. After that No. 995 ran smartly down to Carlisle, the Ais Gill-Appleby length taking 16¾ min., the Appleby-Lazonby stretch 14 min. 5 sec., and the last "lap," 16 min. 5 sec.—total, 46 min. 55 sec. from Ais Gill and 88 min. 10 sec. from Hellifield. Speed on the downhill stretches was maintained mostly at about 70 m.p.h., and the minimum beyond Armathwaite was as high as 58½ m.p.h. The driver of No. 997 however, after touching 71½ m.p.h. and running from Ais Gill to Appleby in 16 min. 50 sec., appeared suddenly to come to the conclusion that he was travelling too fast, and so managed to consume no less than 16 min. 40 sec. on the next length to Lazonby, and 17 min. 5 sec. thence to Carlisle, thereby taking in all 93 min. 20 sec. from Hellifield. This loss of 3¼ min. appeared to me quite without excuse.

I have had only one up journey over this route, the train concerned being the 12.1 noon from Carlisle to London. This had a modest load, on the occasion on which I travelled, of 179 tons, or 185 tons with passengers and luggage, and was

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hauled from Carlisle by a class "3" superheater 4-4-0—No. 724. On the first stage of the journey our driver took things somewhat easily, not rising above 39 m.p.h. on the 7 miles at 1 in 132 past Scotby; consequently we took 17 min. for the first 10 miles to Armathwaite, but touching 64 m.p.h. on the short descent before Lazonby we were through that place, 15½ miles, in 23 min. 25 sec. The next 15¼ miles to Appleby, rising at fairly easy grades, occupied 18¾ min., and then, attaining 56½ m.p.h. on the short descent before Ormside, we ran the 15-mile ascent thence to Ais Gill—almost entirely at 1 in 100—in 25¾ min., speed falling to 29½ m.p.h. So Ais Gill, 48¼ miles, was passed in 70 min. 50 sec., and Hawes Junction, 51¼ miles, was reached in 74 min. 55 sec. This meant a loss of 2 min. on booked time; but the arrears were easily regained on the next section. From Hawes Junction we passed Blea Moor, 8¼ miles, in 12 min., and then covered the 14 miles down to Settle Junction in 12 min. 10 sec., twice touching 75 m.p.h. So Hellifield, 25½ miles, was passed in 27 min. 40 sec., and Skipton, 35½ miles, in 38½ min., speed falling to 45½ m.p.h. on the 1 in 184-215 past Hellifield, and rising to 68 on the descent to Skipton, before being checked to 35 at Skipton Junction. Skipton to Shipley Junction, 15¼ miles, took 17 min. 40 sec., and, after reducing speed to 30 m.p.h. at the latter point, and approaching Leeds very cautiously, we compassed the remaining 10¾ miles in 14 min. 35 sec—a total of 70¾ min. for the 61½ miles from Hawes Junction. This was quite a cheerful trip, as the timing for this train is 74 min., and the pre-war figure was only 4 min. less, *i.e.*, 70 min.

I pass over the Leeds-Nottingham portion of the run, which was so delayed as to be uninteresting, and continue from Nottingham, our engine being now non-superheated 4-4-0 No. 731, class "3." Load remained unchanged. On the 10-mile rise out of Nottingham, mostly at 1 in 200, we maintained 47-48 m.p.h., passing Upper Broughton, 10¾ miles, in 16 min. 25 sec., and Melton, after slacking to 40 m.p.h. at the Junction, 18¼ miles, in 24 min. 55 sec. Then follows a 9-mile rise, mostly at 1 in 274–299, and here we did rather poorly, speed ranging around 41 m.p.h.; the 11¼ miles from Melton to Oakham took 15½ min. Speed did not rise above 64½ m.p.h. at Manton and 70½ at Harringworth; Manton, 33¼ miles, was passed in 44 min. 5 sec., and the 9 miles from Oakham to Harringworth were reeled off in 8 min. 40 sec. On the 7-mile bank

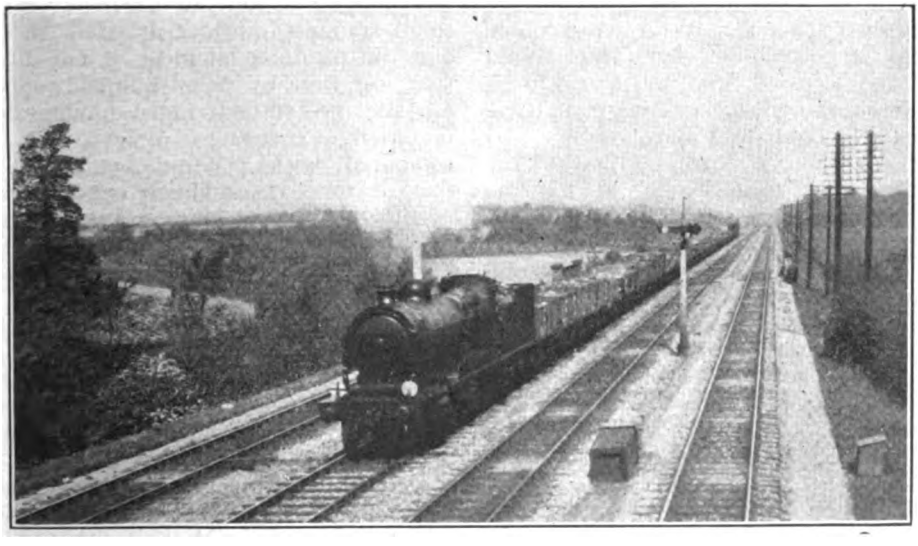

Photo.] SOUTH EASTERN & CHATHAM RAILWAY. [*E. A. Gurney-Smith.*

Express goods train passing Orpington. R.O.D. engine, No. 1720 (Great Central Railway "Conso'idation" type).

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past Gretton (5½ at 1 in 200), we again did poorly, falling to 36 m.p.h., and then, not accelerating above the mile-a-minute rate before Kettering, and slacking to 25 m.p.h. to cross over to the fast roads, we ran through that station, 51½ miles, in 66 min., a minute over schedule time. At Wellingborough that minute had expanded to two, the recovery from the slack having been so slow that we took 8 min. for the 7 intervening miles, and only reached 58½ m.p.h. at the latter place. The 5¼ miles up to Sharnbrook Summit were run in 7 min. 25 sec.—minimum exactly 30 m.p.h. on the 1 in 119—and we then descended to Bedford as though we had the whole day before us, the 10 miles from mile-post 59¾ taking 11 min. 35 sec., with no higher speed than 60 m.p.h.! From Bedford up to Luton we took 24 min. 55 sec., having fallen to 43½ m.p.h. on both the long stretches at 1 in 200, and so we had now lost 3 min. all but 5 sec. on our 115-min. schedule to this point. But then we went more briskly, the 10¼ miles to St. Alban's being covered in 11 min. 20 sec., the 13 miles thence to Hendon in 12¼ min.—maximum at Radlett, 72½ m.p.h., and minimum at Elstree, 53—and the 5½ miles on to Kentish Town, 5¾ min. Finally we were brought to a dead stand just outside the terminus in 149 min. 20 sec. from Nottingham, which means that our net time to London was 150 min., or 1 min. over schedule. With a reasonable descent of Sharnbrook bank this would not have occurred, and the sluggishness here was the more inexcusable in that we had left Nottingham 2 min. late.

In conclusion, a down journey on the complementary train, leaving St. Pancras at 9.15 a.m., is worth description. No. 750, class "3," non-superheater, was the engine, with a 33-axle load of 209 tons—all but the maximum of 210 tons allowed this class of locomotive north of Kettering, and only 11 tons short of the allowance to Kettering—or 220 tons with passengers. We were nearly stopped by signal at Cricklewood, and the work thence to Luton was very poor, as it took us 31 min. 25 sec. to get through St. Albans and 44 min. 25 sec. to Luton, where we were 6½ min. late But we touched 72½ m.p.h. before Bedford, running the intervening 19½ miles in 19 min.; Bedford up to Sharnbrook Summit took 12¼ min., with a minimum of 38 m.p.h.—quite good, this!—and Sharnbrook Summit to Wellingborough, 5 min. 20 sec., with a top speed of 69 m.p.h. Kettering was passed in 88 min. 40 sec., and we were now 3¾ min. late. Slacking severely for the cross-over we took 10 min. 50 sec. for the 7½-mile rise to Weldon; but the Weldon-Manton "dip," 10¾ miles, was covered in 11¾ min., with a maximum speed of 66 m.p.h. Oakham, 22 miles from Kettering, was passed in 27 min. 35 sec., and the next 11¼ miles down to Melton were run in 11 min. 40 sec., with a maximum of 68 m.p.h. Our time of 127 min. 55 sec. from London was thus all but 3 min. over schedule. But we lost ¾ min. on to Nottingham, the 7 miles up to Upper Broughton, after slacking at Melton Junction, taking 10¼ min., and the remaining 10¾ miles to Nottingham, 11½ min., with a top speed of 68 m.p.h. Thus our total time for the 123½ miles from London was 149 min. 40 sec., or about 147 min. net.

Some runs on the Manchester route I must hold over, also one on the "crack" 2.10 p.m. from Bristol to Derby, for a more convenient occasion. Most of these current Midland runs have the same characteristics, and they are principally the dropping of time by drivers, even if in small amounts, without apparent reason, and the regaining of most, if not all, of that lost time by smart station working, all Midland station times having been materially expanded of recent years, as compared with pre-war practice. But these features are an almost exact reversal of Midland pre-war express train practice, when the lost time, if any, was generally in consequence of the very tight working allowances at stations, and almost invariably was regained by the splendid work of the locomotive drivers. However, we may hope that when the latter become accustomed again to the accelerated bookings it will be possible for recorders of locomotive running to note once more those characteristics in performance which in the past have made famous the express train services of the Midland Railway.

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Photo.] CUFFLEY STATION, LOOKING NORTH. [*H. L. Hopwood.*

The Enfield-Stevenage Loop Line:

GREAT NORTHERN RAILWAY.

By H. L. HOPWOOD.

WITH the opening of the line between Cuffley and Langley for freight traffic in 1918 an important section of the Great Northern Railway in course of construction for a number of years practically reached completion. The Enfield-Stevenage loop line has for its object the relief of main line traffic as between London and Stevenage. To appreciate the position, it must be borne in mind that the four tracks of the main line become only two between Greenwood and Potters Bar (2 miles 47 chains) and also between Digswell and Woolmer Green (2 miles 6 chains). Included in these two sections are constructional works of great size, viz., five tunnels of a total length of 3,322 yards and the lofty 40-arch Digswell viaduct at Welwyn. To duplicate these and provide four tracks would have been both a difficult and expensive matter, without the advantage of tapping additional sources of traffic. Twenty-five years ago the cost of widening was estimated at £800,000.

An alternative proposal was to extend the Enfield branch, via Hertford, to join the main line near Stevenage, and thus form a second route as between Wood Green and Langley Junction. Although a more expensive scheme,* involving, as it did, some heavy engineering work, it was considered that the additional outlay would be justified by the amount of new traffic which the loop line would create. It was also an obvious advantage to possess a second route out of London.

The Act authorising construction was dated 1898, but even at that time the project was by no means a new one. So far back as 1865, a "Hornsey and Hertford Railway" had been suggested as an alternative route to that provided by the main line. This line would have extended from Wood Green to Herting-

* The estimated cost was £1,250,000.

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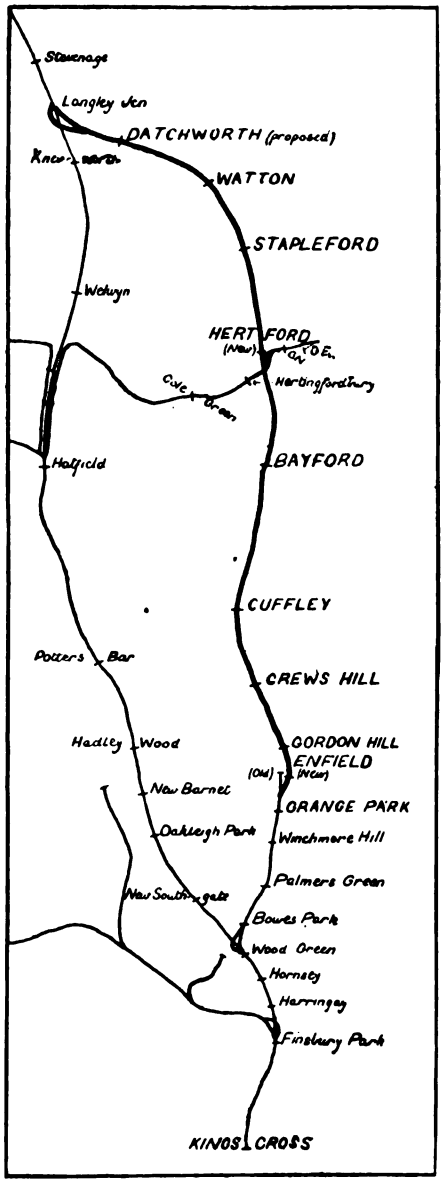
fordbury, on the Hatfield-Hertford-branch, but nothing more definite then resulted than the making of the branch from Wood Green to Enfield; this being opened in April, 1871.



ENFIELD-STEVENAGE LINE, GREAT NORTHERN RAILWAY.

Diverging from the Enfield branch at Grange Park Junction, the new line runs, via Cuffley and Hertford, to Langley Junction, a point on the main line midway between Knebworth and Stevenage. Its length is 19½ miles and it serves a district hitherto without railway communication. Although authorised in 1898, construction was not taken in hand until January, 1906, when the contract for No. 1 section, extending for 5 miles from Grange Park Junction to Cuffley, was let to Mr. H. M. Nowell. Geologically, the line is situated almost wholly in the London clay, and owing to the slipping propensities of the latter, all cuttings and embankments are made with a slope of 1 in 3. Between Grange Park and Cuffley nearly 1,000,000 cubic yards of material were taken from the cuttings, one cutting alone involving the removal of 450,000 cubic yards of excavation. The maximum depth of cuttings is 42 ft. and the height of embankments, 43 ft. On this section there are three brick arch and four girder underbridges, and a massive five-arch road bridge over the railway at Gordon Hill. There are also two large viaducts. That at Rendlesham (north of Gordon Hill) has a maximum height of 66 ft. and a length of 495 ft.; the 14 arches being each of 30 ft. span. Soper's Farm viaduct (between Crews Hill and Cuffley) consists of 11 30 ft. arches and is 390 ft. long and 54½ ft. high.

A new station was opened at Grange Park, immediately south of where the new line commences, and other stations were erected at Enfield, Gordon Hill, Crews Hill and Cuffley. Gordon Hill has two island platforms, but only the up platform is used as such; other stations are of the ordinary roadside type. This line was opened to Cuffley on April 4, 1910, when the portion of the Enfield branch between Grange Park Junction and Enfield Old Station fell into disuse, so far as passenger traffic was concerned. Most trains that had hitherto run to Enfield, were extended to Gordon Hill, but a good number went through to Cuffley. Among the latter was a solitary North London train, which left Broad Street at 2.48 and returned from Cuffley at 4.3 p.m. Now, however, it does not run north of Gordon Hill.

In the meantime, contracts for the other sections had been placed—with R. McAlpine and Sons for the portion between Cuffley and Hertford; and with

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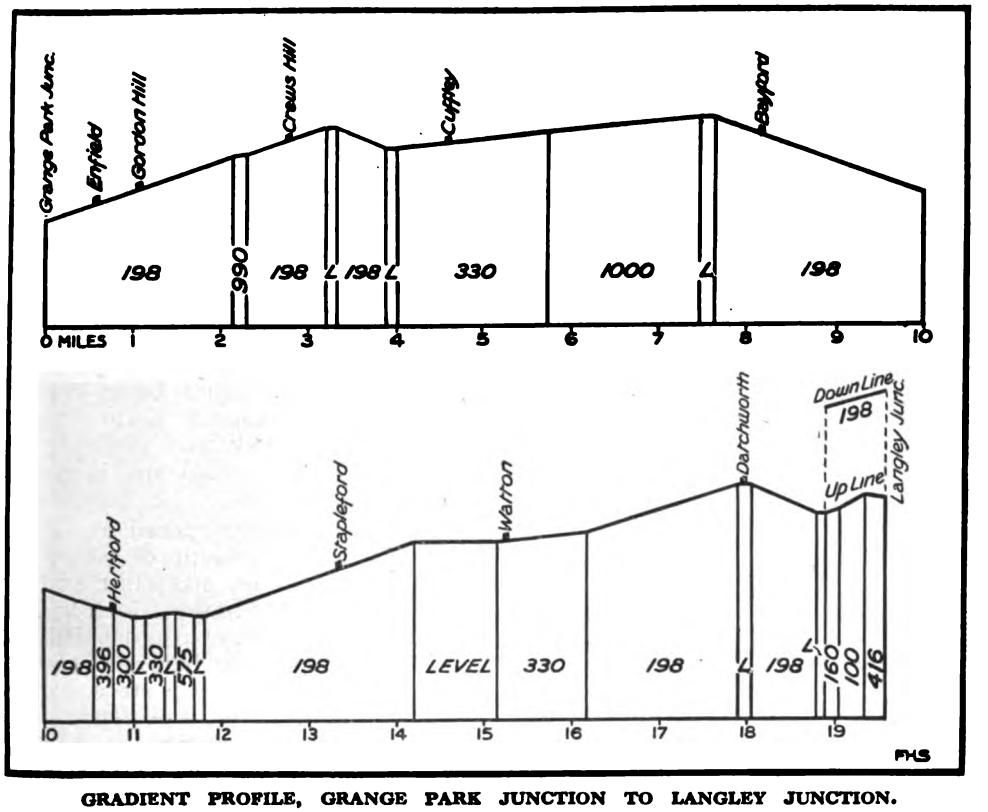
H. Arnold & Son for that part between Hertford and Langley Junction. The heaviest engineering work of the whole line occurs in the Cuffley-Hertford section, where there are a long tunnel, six bridges and two viaducts. At one time Messrs. McAlpine were running 14 of their engines, four of which came new to the contract from Hudswell, Clarke & Co.

One mile north of Cuffley station is Ponsbourne Tunnel, which, with a length of 2,684 yards, is now the longest tunnel on the Great Northern system. It is ventilated by five shafts each 10 ft. in diameter and with a maximum depth of 140 ft. Half-a-mile from the north end of the tunnel is Bayford, the only intermediate station between Cuffley and Hertford. Before the latter town is reached, two large viaducts are crossed. Horn's Mill viaduct carries the railway over the Hatfield-Hertford main road and also the River Lea. It is 50 ft. high and consists of seven arches. Six of these are each of 45 ft. span and one—that over the River Lea—is of 48 ft. span. Almost immediately following is the Hertford viaduct, which has 20 brick arches and one intermediate girder span. The latter, built on the skew, is 87½ ft. long and carries the new line over the Hatfield-Hertford branch. The height of the viaduct is 41 ft., whilst the spans of the brick arches vary from 30¾ ft. to 32½ ft. Between the viaduct and the new Hertford station the line parallels the Hatfield-Hertford branch for some distance, and a temporary connection was put in for the use of the contractor. It has since been removed, but will be relaid as a permanent feature in due course. At Hertford the new station will have two island platforms and four roads. On this section the cuttings have a maximum depth of 47 ft. and the embankments a maximum height also of 47 ft. From the cuttings, 920,000 cubic yards of material were excavated.

In the Hertford-Langley section there are one tunnel, 21 underbridges and nine



GRADIENT PROFILE, GRANGE PARK JUNCTION TO LANGLEY JUNCTION.

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overbridges. Molewood Tunnel is situated ¾-mile north of Hertford station and measures 347 yards. Near Langley Junction the down line burrows under the main line tracks, and the bridge carrying these lines was a work difficult of execution on account of the heavy and continuous main line traffic. There are intermediate stations at Stapleford and Watton, and another is proposed at Datchworth (between Watton and Langley). A ruling gradient of 1 in 198 has been adopted throughout.

The war greatly delayed construction, and it was not until March 4, 1918, that the line was opened from Cuffley to Langley. Owing to the difficulty of obtaining material, no more than a single track was laid, and this was brought into use, for freight trains only*, on the date mentioned. The present service consists of four down and five up trains. As passenger trains do not run beyond Cuffley, stations north thereof have not been completed.

This single line section is 14¾ miles long without any intermediate signal box or crossing place, and in practice it is largely used alternately as an up and down line, *e.g.*, up trains follow each other at certain intervals and at such times as there are no trains in the opposite direction.

To meet the special conditions, Tyer & Co.'s "No. 5 Absolute and Permissive Tablet" instruments have been installed. Although previously used to some extent in the Colonies, the Great Northern is the first railway in this country to adopt them. With the ordinary staff and ticket system in operation on sections of average length, delays to trains following each other are negligible; but in the present case, with a 14¾ miles section, the use of such a system would mean that until an up train had cleared Cuffley, no following train could leave Langley, thus causing much delay. To avoid such loss of time, Messrs. Tyer's No. 5 Absolute and Permissive system of working, previously referred to, has been adopted. In "Absolute" working, only one tablet for the section can be out at a time, but in "Permissive" working, a second and subsequent tablet may be withdrawn, although the first has not been placed in the instrument at the other end. It

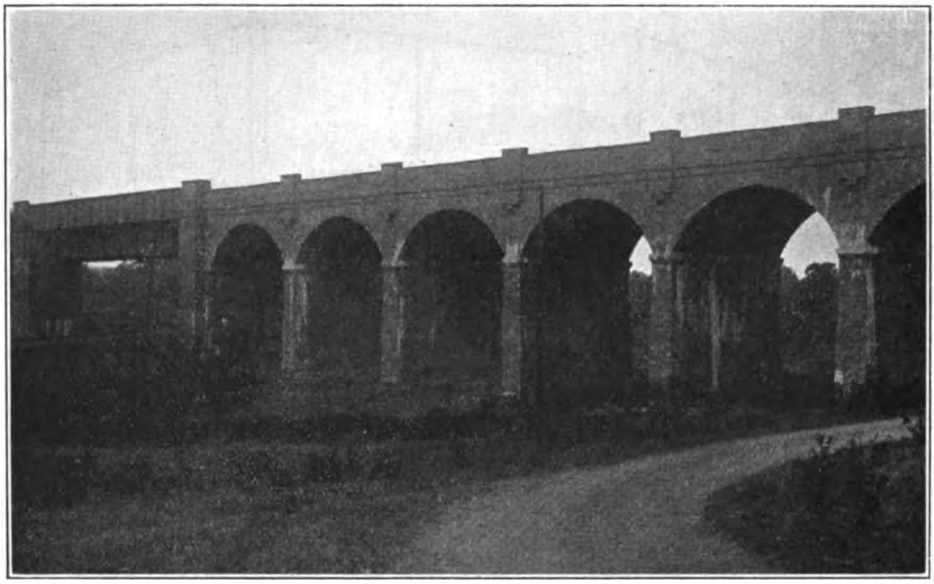

Photo.] HERTFORD VIADUCT. [*H. L. Hopwood.*

The complete viaduct includes 21 spans. The girder section to the left carries the new line over the Hatfield-Hertford branch.

* Passenger trains were diverted to this route on February 6, when the main line was temporarily blocked at Welwyn.

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is possible to take out any number of tablets up to 48, and thus allow 48 trains, if necessary, to run following each other; an indicator shows the actual number in section at the same time. On entering the section, each driver is warned that another train is in front, and, as an additional reminder, the tablet is placed in a special pouch to denote "Permissive" working. It is possible to cancel "Permissive" working after one or more tablets have been withdrawn by restoring them to their original instrument.

Telephones, communicating with Cuffley and Langley, are fixed at various places before joining it on the down side. The junction between the single and double lines has spring-controlled switches. Normally, they lie open for the down direction and up trains can run through them.

So soon as the line north of Cuffley is fully opened, it will provide the shortest route for passengers between London and Hertford, the distance from King's Cross being 19¼ miles. Distances by the other two routes are—from Liverpool Street, 24¼ miles; and from King's Cross (via Hatfield), 27¼ miles. The new Hertford station is unavoidably located away from

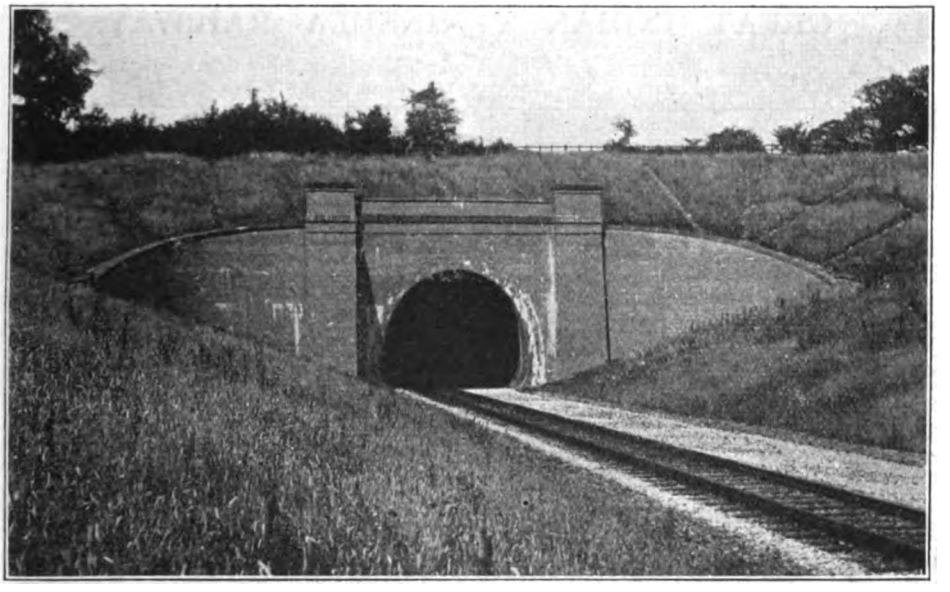

Photo.] PONSBOURNE TUNNEL, SOUTH END. [*H. L. Hopwood.*

The longest tunnel on the Great Northern Railway, 2,684 yards in length.

en route for the use of trainmen in cases of emergency. Up trains running through Ponsbourne tunnel are controlled by a distant signal near Bayford, and a home signal, the latter being of the "banner" type. Trains passing through the tunnel in the down direction are regulated by the Cuffley signals.

From Cuffley to Bayford, the single line is laid on the down side. It next occupies a central position for some distance, but goes through Hertford station on the up side. Approaching Langley, the line becomes double and the down track passes beneath the main line the business centre of the town, but no doubt future passenger trains terminating at Hertford will run to the old station, *via* the spur line which will be constructed.

The Enfield-Stevenage scheme includes the widening to four tracks of the present double line between Wood Green and Gordon Hill. At Wood Green, the "fly-over" down line, with a rising grade of 1 in 55, will be abandoned in favour of a burrowing junction under the main line. This part of the scheme, however, has not yet materialised.

The new railway opens up some of the

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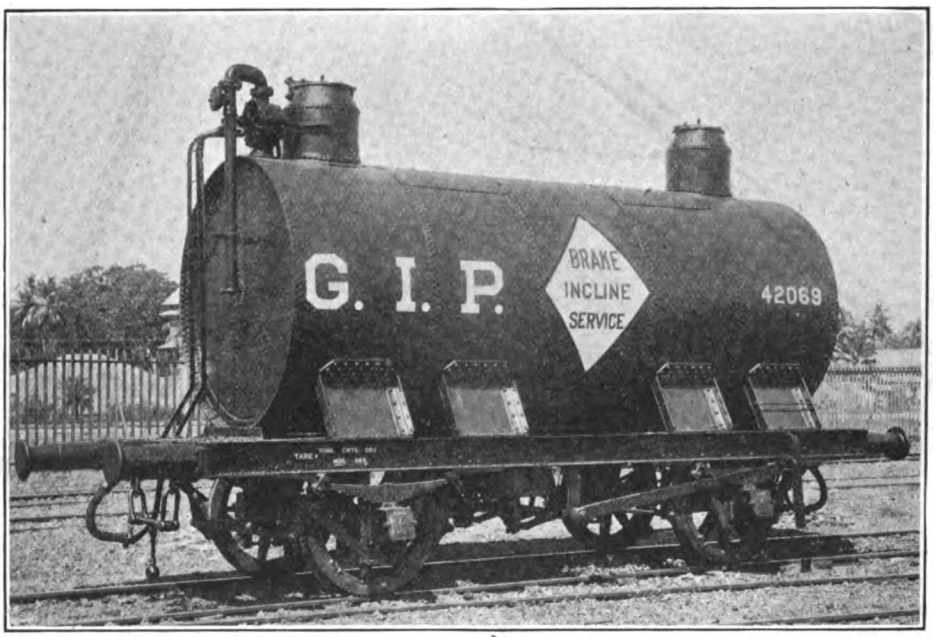
best country in Hertfordshire. Cuffley is the northernmost station to which passengers can travel at present, and this place has become very popular for Saturday and Sunday outings; whilst thousands travel thence on Bank Holidays. It would be difficult to say what are the attractions of Cuffley itself, as a dozen or so of cottages and the local inn are the sum total of the village. The real reason of its popularity is its situation amidst some of the finest scenery that Hertfordshire can offer. The locality attained some degree of fame during the war, for it was at Cuffley that there perished, on the early morning of Sunday, September 3, 1916, the first German airship (SL 21) to be brought down on English soil. The accompanying photographs were taken in August, 1919.

EMERGENCY BRAKE VAN, GREAT INDIAN PENINSULA RAILWAY.



OIL TANK WAGON FITTED WITH AUTOMATIC VACUUM "LOAD" BRAKE AND FILLED WITH WATER TO ACT AS AN EMERGENCY BRAKE VEHICLE DURING THE WAR PERIOD.

Several main routes of the Great Indian Peninsula Railway include long inclines requiring the services of powerful banking engines for ascent and special brake equipment in the downward direction. During the war period a number of oil tank wagons were filled with water and utilised as emergency brake vans for incline service, being fitted with the Vacuum Brake Company's new "load" brake, as introduced in the working of vacuum-fitted freight trains on the Great Indian Peninsula Railway and elsewhere. The purpose of this "load" brake is to provide supplementary brake power which can be brought into action when required.

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Locomotive and Train Working in the latter part of the 19th Century.

NORTH BRITISH RAILWAY. [No. IV.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THE fourth class of tank engines built in 1880 to 1883 at Cowlairs, were also of the 4-4-0 type, but of much smaller dimensions than the large Helensburgh tanks. They were intended for local branch traffic and had 16 in. by 22 in. cylinders, 5 ft. coupled wheels, and leading bogie wheels 2 ft. 6 in. diam., the latter with solid centres and no spokes. The boilers of some of them had 701 sq. ft. total heating surface, and the total weight in working order was 36½ tons, of which 10½ to 10¾ tons were carried by the bogie. The side tanks were only of small capacity and carried 655 gallons of water. There are 30 of these little engines, of which the first 24 were of Mr. Drummond's build. The list of these was as follows :—

19. *Strathendrick.*	103. *Montrose.*
33. *Bellgrove.*	104. *Roslin.*
52. *Dirleton.*	105. *Penicuik.*
60. *Airdrie.*	109. *Addingston.*
67. *Clarkston.*	110. *Kinross.*
72. *Morpeth.*	111. *Clackmannan.*
73. *Rothbury.*	147. *Slamannan..*
74. *Coatbridge.*	174. *Lennoxtown.*
75. *Sunnyside.*	225. *Milngavie.*
98. *Aberfoyle.*	268. *Bothwell.*
99. *Roxburgh.*	294. *Clydebank.*
101. *Anstruther.*	299. *Hamilton.*

Six later engines built in 1884 by Mr. Holmes were without names, the numbers being 76 to 79, 316 and 483. They differed principally from the earlier engines in that the safety valves on the domes had two small columns instead of being of the Ramsbottom type which Mr. Drummond used. A considerable number were employed on the local trains in the Edinburgh and Glasgow districts, and several branch lines were worked by them. During Mr. Drummond's superintendency the passenger engines were painted a yellow colour, very similar to Stroudley's Brighton engines, with the underframes of a claret colour, while the goods engines and "Terrier" tank engines were dark green with red lines. No. 38, mentioned last month, was an oddity; the engine was painted yellow, but the tender was for some years dark green.

The goods engines were of two classes of which the larger, consisting of 32 engines, had 5 ft. wheels and 18 in. by 26 in. cylinders, with 150 lb. pressure. These, which were used for the heavier main line traffic, more especially over the Edinburgh-Carlisle road, bore a very marked resemblance to Mr. Stroudley's goods engines. The smaller class for general service had wheels of the same size but the cylinders were 17 in. by 26 in. except one lot of a dozen engines with 17 in. by 24 in. cylinders.

The most awkward portion of the North British system was that which professed to form some sort of connection between Edinburgh and the northern cities of Dundee and Aberdeen. A journey northwards from Edinburgh through Fifeshire was one not to be undertaken lightly. From Edinburgh a local train conveyed the passengers to Granton, where they were transhipped to the ferry boat which crossed the Forth to Burntisland. The waters of the Firth of Forth can be very unpleasant at certain seasons of the year, and a bitterly cold east wind can blow there in a manner which seems to beat its method of blowing anywhere else.

The passengers' luggage was placed on barrows at Waverley station, and these were wheeled on to a couple of fish trucks attached to the Granton train. At Granton the barrows were trundled off the fish trucks on to the ferry boat, and it was only on their arrival at Burntisland that the luggage was removed from them and placed in the vans of the train waiting to take the passengers to Tayport. These trains were usually worked by the 0-4-4 (originally 0-4-2) tank engines of the 88 class, though these engines really entered upon their work in this district at about the time the first Tay Bridge

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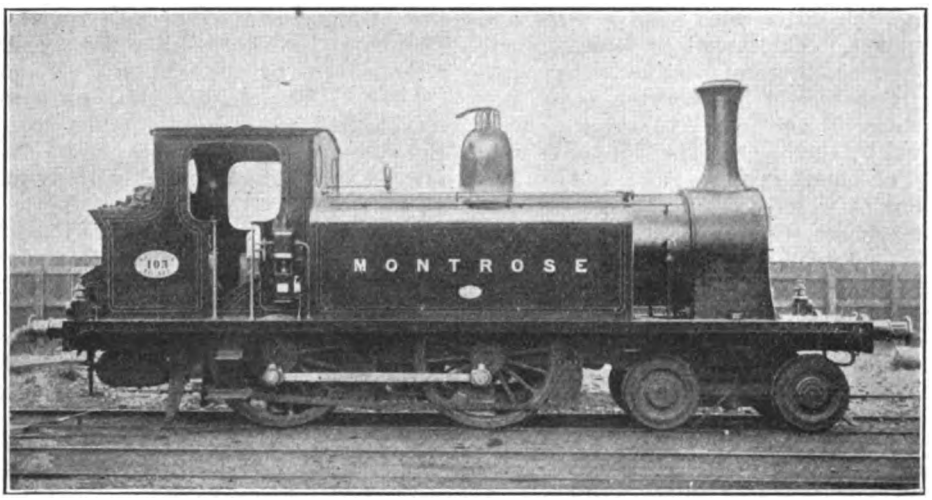
was opened in 1878. Then there ensued a journey of an exceeding slowness from Burntisland to Ladybank Junction, where a few coaches for Perth were detached, and the slowness increased with painful impressiveness from Ladybank to Tayport, where the unfortunate through passengers were again transferred to another ferry in order to cross the Tay. Eventually they were landed at Broughty Ferry Pier. Here another train had to be requisitioned, which ran over the branch to Broughty Junction, where the engine had to reverse, and eventually the saddened cavalcade reached Dundee. The actual rail journey was only about 46 miles of which 36 miles represented the Fife-to crossing the Forth on the ferry boats, and travelled by the route via Larbert and thence over the Caledonian Railway. The first step taken by the company in the direction of improving the communication with Dundee was the opening of the first and ill-fated Tay Bridge in 1878, and a new line to the bridge was made from Leuchars Junction, where it left the old Tayport line, to the south bank of the river opposite Dundee. The old bridge was 3,458 yards long and consisted of 85 spans of which the 13 middle ones were each 245 ft. long. The lateral wind pressure which it was calculated to withstand was *apparently* sufficient.

On Sunday, December 28, 1879, the



4-4-0 TANK ENGINE NO. 103, "MONTROSE."
Designed by Mr. D. Drummond and built at Cowlairs, 1881. Coupled wheels, 5 ft. diam. Cylinders, 16 in. by 22 in.

shire portion of the journey from Burntisland to Tayport, in addition to which there were the ferry boat crossings. The fastest down train was timed to leave Edinburgh at 6.25 in the early morning, probably in order to show the passengers the coldest beauties of the east wind when crossing the Forth. This train reached Dundee at 9.37 a.m. The 12.50 p.m. up train from Dundee also required 3 hours 12 min. for the journey to Edinburgh.

The North British Company can, however, hardly be blamed for the slowness of this service, for the difficulties were great. Moreover, many passengers for Perth and Dundee had a strong dislike evening train from Burntisland to Dundee, conveying through passengers from Edinburgh and the south, was drawn by the old "Wheatley" 4-4-0 engine No. 224, which was at that time spare engine at Dundee. A furious gale was sweeping down the Tay, and when the train reached the high girders in the middle of the bridge, it offered a broadside target to the wind, and both train and girders were hurled into the river. The fury of the gale completely drowned any sound of the catastrophe, and the only indication that something might be wrong was given by a flash of fire seen by a platelayer on the south side of the bridge. The signalman

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on this side noticed that the tail lights of the train had disappeared, and tried to ring up the signal box on the north side, but failed to receive any reply. Then on walking carefully along the bridge the officials found a huge gap in the structure and it dawned upon them that a fearful disaster had occurred. Seventy-three lives were lost and not a soul remained of those on the ill-fated train.

No. 224 remained for more than three months at the bottom of the river, until in April, 1880, the tender was recovered and removed to Tayport. Shortly afterwards the engine was raised, and was apparently only comparatively slightly damaged. It was put on to the rails at Tayport and travelled on its own wheels from there to Cowlairs, where it was repaired and put to work again.

No. 224 would appear to have gone through enough adventures to be allowed to end its days in peace, but the compounding epidemic of the middle eighties was then at its height, and No. 224 was the engine fated to succumb to the new disease. In 1885 it was rebuilt as a four-cylinder tandem compound, the two low-pressure cylinders, 20 in. by 24 in., taking the place under the smokebox of the original 17 in. by 24 in. cylinders, the high-pressure cylinders, 13 in. by 24 in., being placed in front over the leading bogie wheels, all the cylinders being inside. At the same time Joy's valve gear was substituted for the original link motion.

The arrangement of compounding was on Nisbet's system and the engine ran experimentally for some time, but the extra cost of upkeep and repairs appeared to be greater than the value of fuel saved, so that the plan was subsequently abandoned, and No. 224 was soon reconverted to a two-cylinder simple engine. It was again rebuilt in 1897, and in 1913 was renumbered No. 1192 on the duplicate list. I hear that at the time of writing the old engine is still at work.

A new Tay Bridge was commenced in June, 1882, and the completed bridge was opened for traffic in June, 1887. It differs from the old bridge in that a double line of rails is used throughout, instead of the single line over the old bridge.

After the fall of the first bridge, the system of working had to revert to the use of the ferry. The branch line from Broughty Junction to Broughty Ferry Pier, which had been closed in 1878 on the opening of the bridge, was brought into use again, but as it was in a somewhat neglected and derelict condition, some little time elapsed before it was again ready for traffic, and passengers were, during the interval, conveyed from Dundee to Tayport by steamer. When the branch to the pier was reopened trains from Dundee connected at Broughty Junction with the trains from Aberdeen to Dundee which detached two or three coaches for the Pier. These were picked up by the branch train from Dundee.

In regard to Aberdeen the North British was always at a disadvantage compared with the Caledonian. Through coaches had been run from King's Cross to Aberdeen for many years, but these travelled from Edinburgh *via* Polmont and Larbert and were conveyed thence to Aberdeen by the Caledonian trains. The North British engines worked these trains between Waverley and Larbert, and this system of working was in use until the opening of the Forth Bridge in 1890.

On the opening of the first Tay Bridge in 1878 the North British had a service of two through trains between Dundee and Aberdeen in each direction, worked by the two Drummond bogie engines Nos. 486 and 487. The whole route taken was over Caledonian metals for the Dundee and Arbroath line then belonged to the latter company, and was not made into a joint line until February, 1880. From Arbroath the trains travelled *via* the Friockheim fork near Guthrie Junction and thence over the Caledonian main line. This fork was closed about 10 years ago when the Caledonian service between Dundee and Montrose was withdrawn.

Other North British through carriages to Aberdeen from Dundee were worked on Caledonian trains. These coaches arrived from Burntisland at Dundee (Tay Bridge Station), and the engine was then detached, and another one placed behind. The train was then backed to Camperdown Junction, most of the distance being through a tunnel, and attached to the rear of a Caledonian train which was waiting for it. After the opening of the direct line from Arbroath to Montrose,

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the North British Aberdeen trains were worked over this—the present—main line There were four in each direction, and the engines usually employed were the double-framed 2-4-0's of the rebuilt "350" class, which have been previously described. But the trains were not particularly good in the matter of speed, and were more in the nature of a service catering for traffic between the principal intermediate stations.

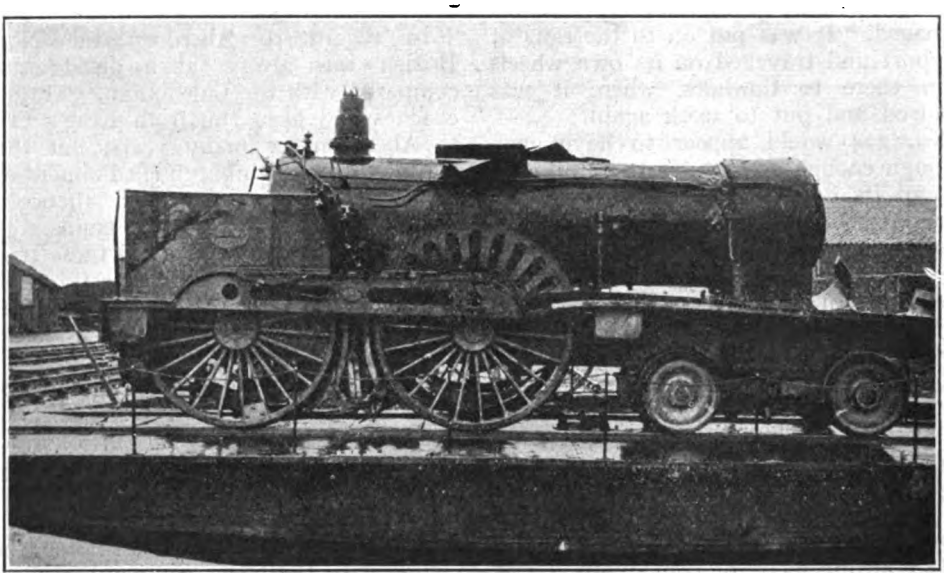
When describing the old 349 class, 2-4-0 engines, with double frames, on pages 326 and 327 of the May RAILWAY MAGAZINE, I mentioned a very similar engine, No. 38. A correspondent writes that this engine was for several years on the Glasgow and Balloch trains, and states that before the introducton of the heavy modern tank engines it was easily the best engine on the semi-fast morning and evening business trains to and from Glasgow, and that a good run always resulted when this engine was on the up morning trains.

In those days the Caledonian and the North British each ran a train from Balloch to Glasgow, booked to leave Balloch at the same time, and as the line is joint to Dumbarton, each of the two railways arranged to start its train first on alternate weeks. Both trains made the same stops to Dumbarton, and the Caledonian had, by agreement with Messrs. Denny, the shipbuilders, to stop at Dumbarton East. From Dumbarton to Bowling the two lines cross each other several times—the Caledonian having the longer route—and remain, more or less, in sight of one another to Clydebank, crossing again near Partick.

There was considerable rivalry between the drivers of the two railways, and when the Caledonian train was the first to leave Balloch the extra stop at Dumbarton East allowed the North British train to draw level with it. The Caledonian, with lighter trains and a 0-4-4 tank engine, generally held its own well, except when No. 38 was on the North British trains, and then it was a poor race, for the Caledonian was generally left behind by the time Bowling was reached. My correspondent, who travelled by both trains for some years, adds that old 38 was marvellous for such an old engine, and that the more modern 4-4-0 engines did not ever show the same turn of speed on the same trains.

I may perhaps add that 38, which had been renumbered 1126 on the duplicate list, was broken up shortly before the war.

(To be continued.)



4-4-0 ENGINE NO. 224, WHICH FELL WITH THE FIRST TAY BRIDGE IN 1879, AFTER RECOVERY FROM THE RIVER.

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Poultry and Small Stock Demonstration Train.

GREAT EASTERN RAILWAY ENTERPRISE.

EXHAUSTED by five years' war and the withdrawal of many millions of workers from industry and agriculture for a like period, there is no more pressing present need in the world than for production. Supply still lags behind demand, and any step that will help to speed up production, whether of food, raiment or shelter, deserves and earns the approbation of all those who comprehend the real cause of so much that seems wrong in human affairs to-day.

Before the war vast quantities of poultry and eggs were imported into Great Britain. Large supplies still come from overseas, but one of the principal sources has been cut off by the revolution in Russia.

With commendable public spirit the Great Eastern Railway directors and their general manager, Sir Henry Thornton, K.B.E., are taking special steps to foster and encourage the production of eggs, poultry and small stock in the Eastern Counties. There is ample scope for much development. The soil is right, and the climate certainly is superior to that of Russia or Denmark for the purpose of poultry rearing. The Eastern Counties may not contain, as markets, the huge industrial centres that may be found in Yorkshire, Lancashire or Glamorganshire, but London, the best market in the world, is served by the Great Eastern Railway system, while in the event of a glut in the metropolis, by no means probable in these times, the Great Eastern Railway, by its joint line *via* Lincoln and Doncaster, provides ready access to the busy

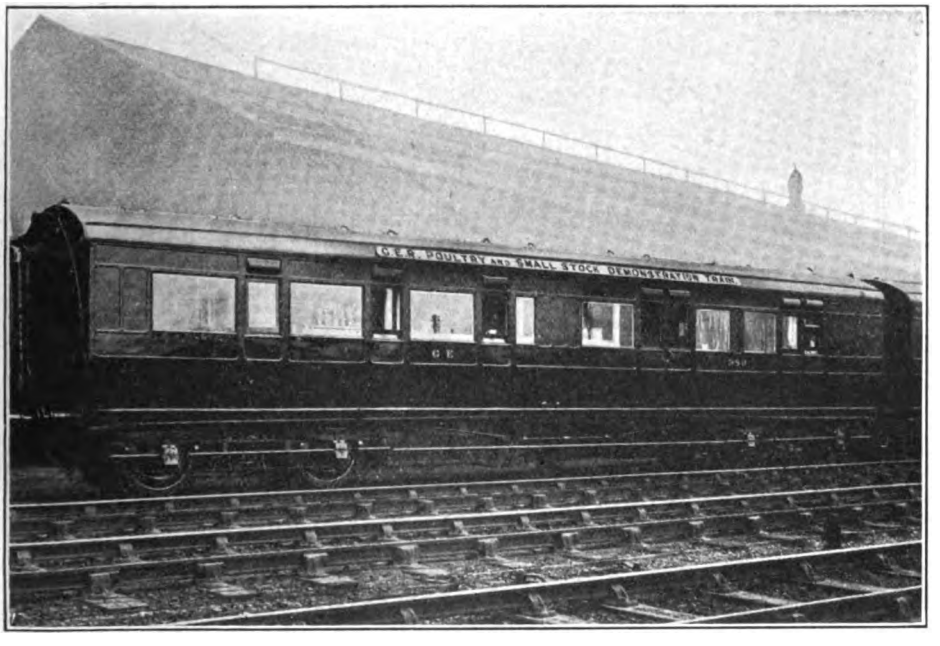

Photo.] EXTERIOR OF ONE OF THE CONVERTED AMBULANCE CARS. [*Topical.*

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throbbing North—the land where chimneys grow—and where workmen are, in these days of high wages, well able to pay good market value for all the eggs, poultry and other small stock specialities the enterprising East Anglian agriculturalist may produce.

In order to put into practice its laudable attempt to improve production in the district it serves, the Great Eastern Railway has converted three of the cars, that formed part of Ambulance Train No. 17, which was used by the British Expeditionary Force in France from March, 1915, to November, 1919, into a poultry and small stock demonstration train. The complete train consists of five cars, the other two cars being a dining car for the use of the demonstrators and lecturers and a composite brake van. In the demonstration cars are exhibited a most useful collection of live stock and the latest and most approved agricultural appliances. 'Experts accompany the train for the purpose of giving information and advice with regard to poultry, bees, rabbits, goats, cheese-making, horticulture, including bottling and canning of fruits, and allotment gardening.

For the six weeks ended June 28, arrangements were made for the following stations to be visited :—

Clacton-on-Sea,	Saxmundham,
Romford,	Stowmarket,
Southend-on-Sea,	Diss,
Chelmsford,	Yarmouth (South Town),
St. Botolph's,	Lowestoft Central,
Maldon East,	Framlingham,
Braintree,	Reepham,
Bishop's Stortford,	Fakenham,
Haverhill,	Dereham,
Cambridge	Norwich (Thorpe),
St. Ives,	Swaffham,
King's Lynn,	Watton,
March,	Bury St. Edmund's,
Ely,	Sudbury,
Hunstanton,	Chingford,
Wisbech,	Hertford,
Wickford,	Epping.
Ipswich,	

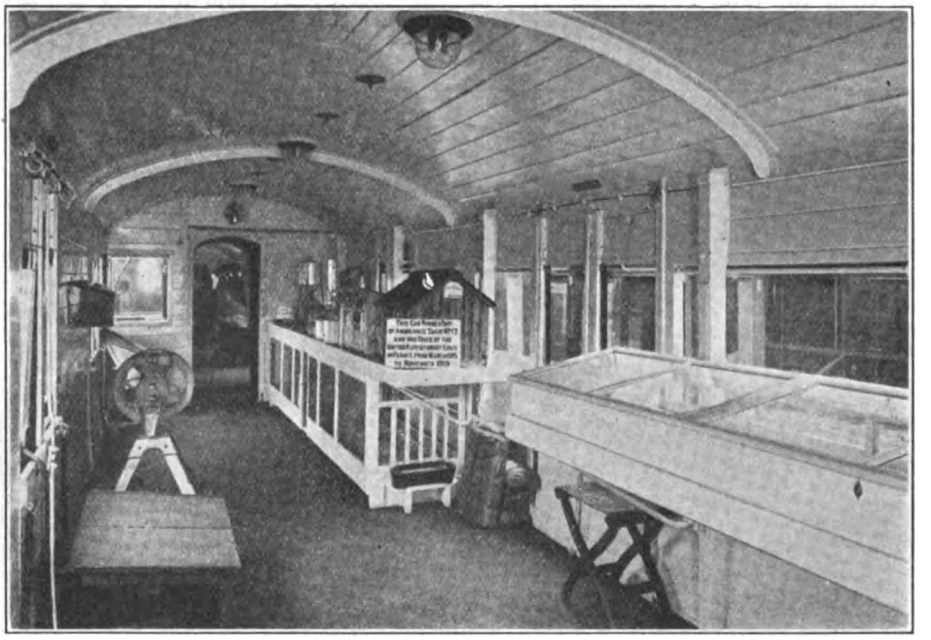

Photo.] INTERIOR VIEW OF DEMONSTRATION CAR. [*Topical.*

The demonstration cars were open to visitors from 1 p.m. to 8.30 p.m.

On the day before setting out on its six weeks' itinerary the train was on view at No. 1 platform, Liverpool Street Station, London, and the Right. Hon. Sir Ailwyn Fellowes, K.C.V.O., K.B.E., Deputy Chairman of the Great Eastern Railway, presided at a luncheon at the

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Abercorn Rooms, Liverpool Street Hotel. He was supported by Lieut.-Colonel Sir Arthur Griffith Boscawen, M.P., Parliamentary Secretary to the Ministry of Agriculture, and several prominent agriculturists. Lord Lee of Fareham, G.B.E., K.C.B., Minister of Agriculture and Fisheries, was unavoidably absent owing to an accident. Great Eastern Railway officers present included:—Mr. T. Chew, Mr. A. P. Parker, Mr. A. J. Hill, Mr. C. Busk, Mr. J. Miller, Mr. F. V. Russell, Mr. E. A. Evans and Mr. H. Parker.

Sir Ailwyn Fellowes, in welcoming the guests and press representatives, said that their poultry and small stock demonstration train would start on its journey the following morning and visit all the principal stations on the system. He reminded them that the Great Eastern Railway ran through a purely agricultural district, and served few great industries and not many large towns. Accordingly, it had always been their endeavour to help agriculturists and to foster and promote the great agricultural interests. The Great Eastern Railway had its own farm at Dodnash, Bentley, Suffolk. Four years ago they had run a specially good poultry demonstration train and the benefits derived from demonstrations then given had been extraordinary. Compared with 1913 they had last year carried 715 more tons of eggs by passenger train and 460 more tons by goods train, an increase of 1,175 tons. He believed that the new train would prove a similar success in increasing the agricultural output in the Eastern Counties.

Sir Arthur Boscawen, Parliamentary Secretary to the Ministry of Agriculture, said that the demonstration train they had inspected that day precisely fitted in with the policy of the Ministry of Agriculture in stimulating agricultural production. They did not again wish to run the risks this country took during the war owing to food shortage. Demonstration trains such as this would be most useful in giving instruction to a large number of small holders, thereby helping to increase what he termed the small lines of agricultural production. The Ministry of Agriculture had approached the Railway Executive Committee and asked them to introduce demonstration trains of this character, but they were told it was not possible. This, however, the Great Eastern Railway had done, and set an example to the other railways of the country.

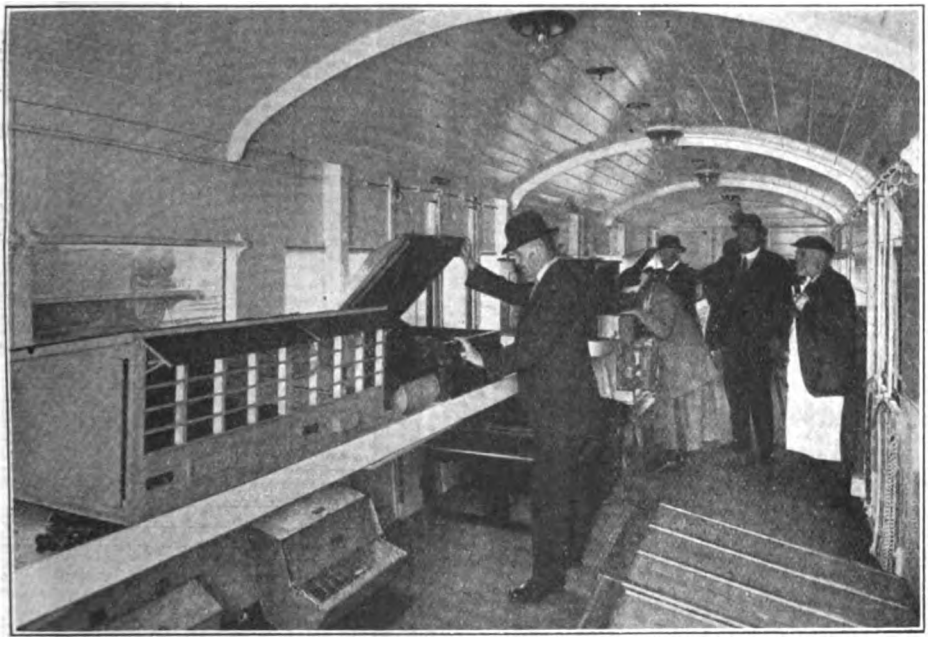

Photo.] INTERIOR VIEW IN POULTRY DEMONSTRATION CAR. [*Topical.*

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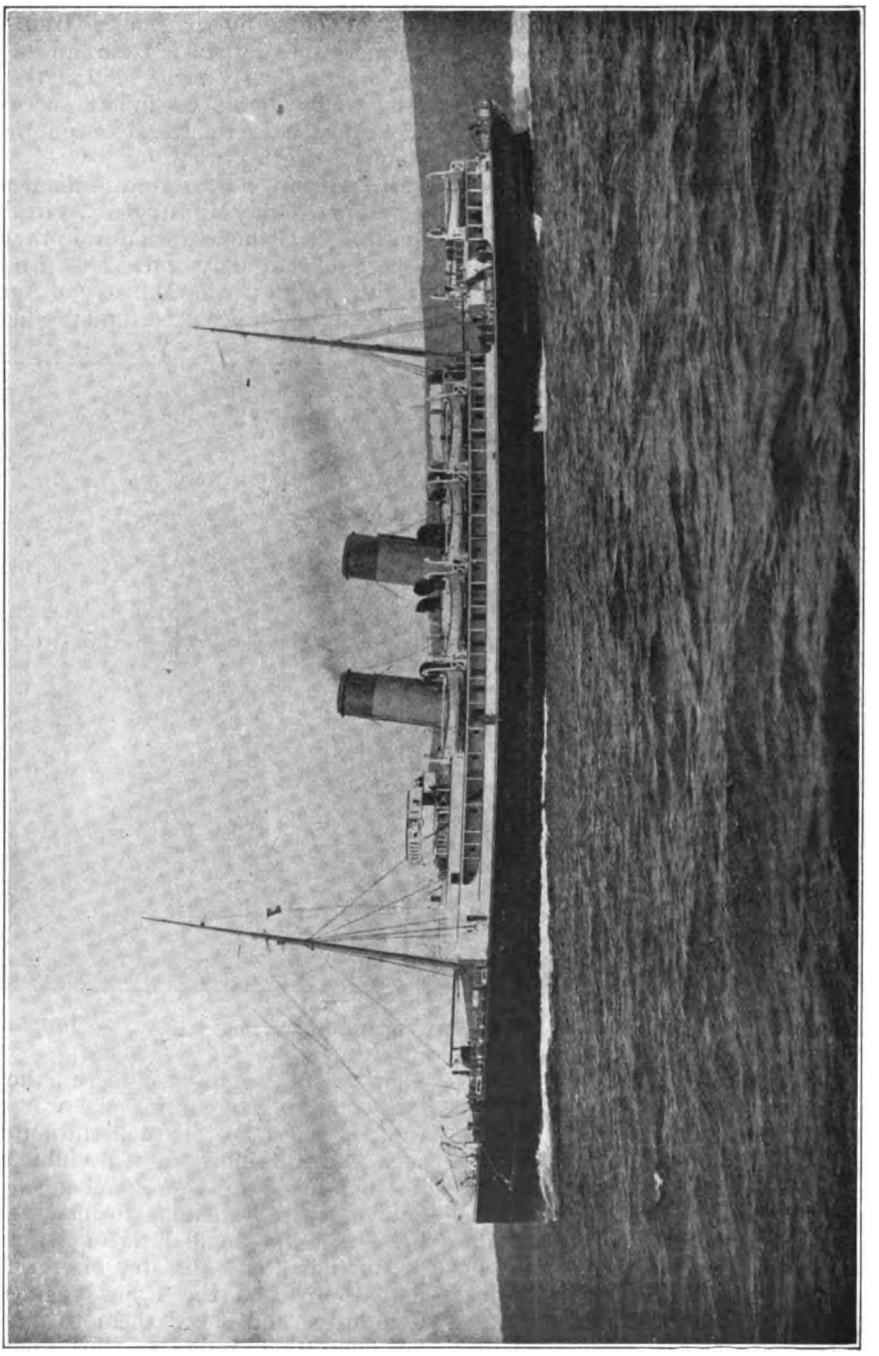

NEW CROSS-CHANNEL TURBINE STEAMER "ANGLIA," LONDON & NORTH WESTERN RAILWAY.

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The Holyhead-Dublin Services.

L. & N.W.R. NEW EXPRESS STEAMERS.

IN 1914 the London & North Western Railway decided to improve the already efficient service between Holyhead and Dublin by placing on this route express steamers considerably in advance of anything to be seen on a cross-Channel run, and to this end placed an order for four steamers with Messrs. William Denny & Bros., Limited, Dumbarton. The need for these vessels has been further accentuated by the loss during the war of the *Anglia* and the *Tara*, the last-named being known as the *Hibernia*, prior to her being taken over by the Admiralty.

Owing to the war the building of the new vessels was delayed but work was proceeded with after the Armistice, and the first of these—the *Anglia*—has now been completed.

The principal dimensions are as follows:

Length, over all	395 ft.
Breadth, moulded	45 ft.
Depth, to awning deck ..	27 ft. 6in.

Built to Lloyd's Special Class for cross-Channel service, and to the latest Board of Trade Regulations, the vessels have been designed to meet all the company's special requirements for their passenger service.

The hull is sub-divided by 11 transverse watertight bulkheads up to the main deck, the collision bulkhead extending to the awning deck, and the spacing of the bulkheads is as required by the International Convention.

Propelling machinery consists of twin-screw geared turbines of Parsons' latest type, supplied by steam from nine Babcock & Wilcox water-tube boilers fitted in three separate stokeholds. The boilers are fitted with forced draught, and the speed with full deadweight on board is 25 knots.

The most up-to-date appliances providing for the safety of the passengers have been installed, these including Marconi wireless installation, with emergency dynamo placed on the boat deck and capable of supplying lighting throughout the vessel in case of failure of the main dynamos, Submarine signalling apparatus, and Stone's system of hydraulically-operated watertight doors, which can be controlled directly from the navigating bridge by the officer on watch. The steering gear is of Brown Brothers' type, with the makers' patent telemotor control.

The latest type of Welin davits are fitted for launching the lifeboats, of which there are 10, and they are capable of putting them out against a considerable list. Life jackets and buoyancy apparatus are also supplied in accordance with the Board of Trade requirements.

In order to facilitate manœuvring, the vessel is provided with a bow rudder and steering-gear, and a special navigating bridge has been fitted aft, complete with engine telegraphs, etc., this being a duplicate of the one forward to enable the vessel to be handled readily when running astern.

The *Anglia* is certified to carry 1,522 passengers, *i.e.*, 936 first-class and 586 third-class, together with a crew of 76.

The large deckhouse on the awning-deck, together with the spaces on the main and lower decks amidships and aft are fitted up for the accommodation of passengers. A pleasant and very noticeable feature of the accommodation is the airiness of the staterooms and public rooms due to the large deck height, which in all cases is 9 ft.

Sleeping accommodation is arranged for about 210 first-class passengers in staterooms and large cabins, and the comfort of the passengers has been ensured by the provision of exceptionally wide sleeping berths.

The main first-class entrance is fixed on the awning deck, and is panelled in oak, lighted by a large dome overhead. A handsome staircase leads to the main deck, on which are the dining saloon, ladies' cabin and staterooms. Among the state-

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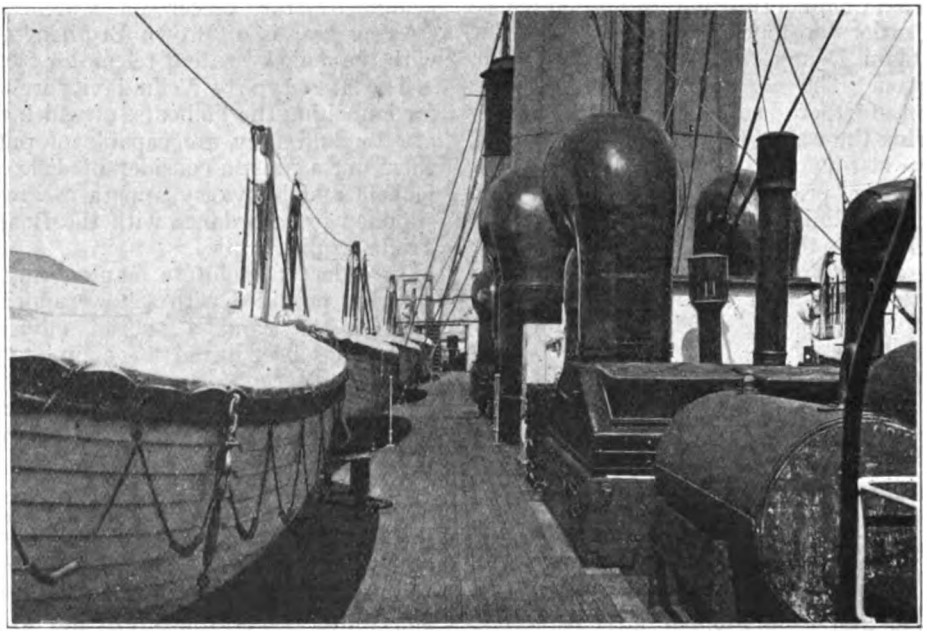
rooms on the awning deck are a number of special rooms, and the decoration and furnishing of these has been gone into at considerable length to ensure the greatest possible comfort for passengers. These rooms are fitted with cot bedsteads, writing tables, dressing tables, etc., and are quite as luxurious as many similar cabins on ocean liners.

Situated on the main deck the first-class dining saloon provides accommodation for nearly 70 persons, mostly at small tables. The special feature of this room is the architectural treatment on bold lines of the wall panelling, the ceiling and the pillars. The panelling is in French walnut, in long panels, with a carved cornice and is relieved at the pilasters with carved drops in limetree, also a handsome carved overdoor at the entrance. At the after end are two large sideboards, one each side, which form a distinctive feature of the apartment.

Other noticeable items, adding to the general effect, are the interior windows which have been fitted over the sidelights and the handsome dome. The design of this room, as also of the other public rooms and special staterooms in the vessel, has been in the hands of Messrs. George A. Crawley & Partners, the well-known London architects.

The ladies' first-class cabin is placed next to the saloon, the panelling being painted white with cushions upholstered in velvet. Leading off this is a large range of two-berthed staterooms reserved for ladies.

The first-class smoke room is located in the deckhouse on the awning deck, and is panelled in oak, in old English style, with small wainscot panels and old fashioned brass lanterns fitted for electric light. Numerous small tables are provided, while the chairs and sofas have been upholstered in green antique hide. The floor is laid with rubber tiles, and overhead is a dome treated to correspond with the wall panelling. A well-appointed bar is fitted at one end, and at the other is a handsome fireplace, with an electric log fire. Glass screens are arranged at the entrance doors to exclude draughts.



BOAT DECK.

Next to the smoke room is the gentlemen's deck cabin, a large apartment fitted with an ornamental central dome overhead. The sides here are panelled and painted, while the upholstery, carpets and curtains are in crimson.

On the same deck and entering off the

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main entrance is the lounge, an apartment worthy of special note. The treatment is in Georgian style, and prominence is given to a handsome fireplace, this one also being fitted with an electric log fire. Interior windows have been fitted, and with the large dome, produce an effect which makes it difficult to realise that one is afloat and not on shore. The effect is increased by the roomy settees and comfortable chairs with which the apartment is furnished. In order to provide additional comfort for the passengers, a pantry has been fitted convenient to the lounge for serving tea, etc.

aft on the awning, main and lower decks. The entrance and smoke room is arranged on the awning deck, and access is gained from this apartment to the general saloon on the deck below, which is well fitted with seats and tables. Convenient to this are fitted a pantry and a bar. Leading off this saloon is a ladies' room with a private entrance to the ladies' sleeping cabin on the lower deck. Two large apartments on the lower deck are also fitted with sleeping berths for men.

Special attention has been paid to the ventilation and heating throughout the vessel, the Thermotank system having been

FIRST CLASS SMOKING ROOM.

Remaining space in the awning deck-house has been given over to first-class staterooms, of which there are a large number. These are well furnished and very comfortable, and it is worthy of note that the four-berth room has been done away with, the rooms being arranged for one and two persons only.

Lavatory accommodation throughout the ship is in the very latest style, the sides and floors being tiled, and the metal fittings electro-plated.

Accommodation for third-class passengers is exceptionally good, and is fitted

installed for the whole of the first and third-class passengers accommodation. Each apartment is provided with louvres for regulating the supply of air, which may be warmed or cooled as desired. In addition a number of electric exhaust fans have been fitted to deal with lavatory and other spaces.

Mention must also be made of the culinary arrangements on board, the galleys and pantries being provided with all the most modern furnishings, *i.e.*, ranges, hot presses, grills, etc., for a vessel on this service.

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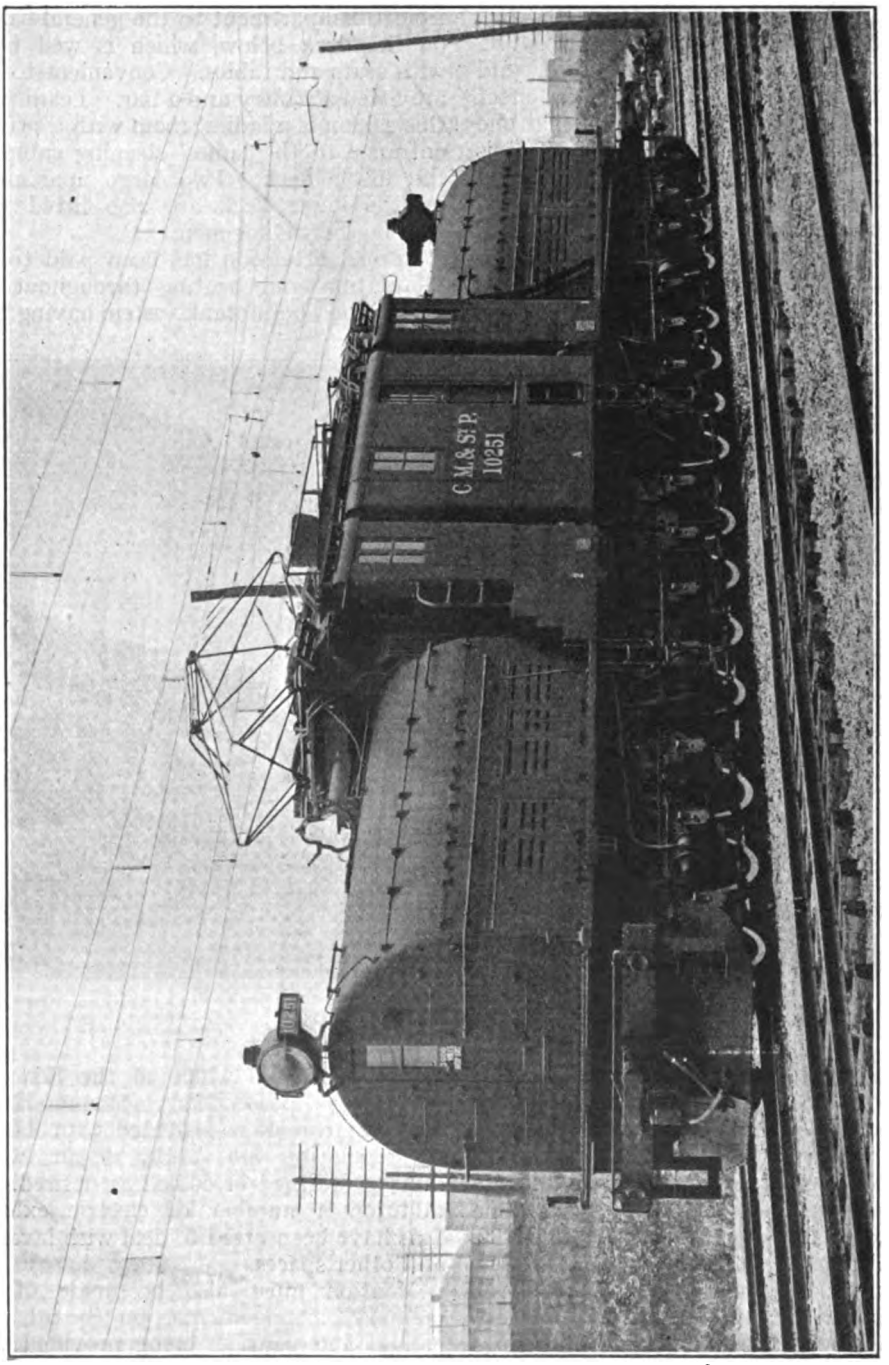

3,000-VOLT GEARLESS PASSENGER LOCOMOTIVE, CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.

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3,000-volt D.C. Gearless Electric Passenger Locomotive:

CHICAGO, MILWAUKEE & ST. PAUL RAILWAY.

REFERENCE has several times been made in these pages to the remarkable electrification carried out by the Chicago, Milwaukee & St. Paul Railway, and a notable design of electric passenger locomotive has recently been added to the equipment, as shown on the opposite page.

The new locomotives weigh 265 tons, with 229 tons on the driving wheels. They have 14 axles, 12 of which are driving and 2 guiding axles. Total weight on driving wheels (229 tons) is 86 per cent. of the weight of the locomotive, but, being distributed among 12 axles, results in a weight of only about 19 tons per axle. Exhaustive trials on the General Electric Company's test tracks at Erie, Pa., have demonstrated the excellent riding qualities of the new locomotives at speeds as high as 65 m.p.h., which is the limit of speed on the length of test track available.

The locomotive is designed for handling in normal service a 12-car train weighing 960 tons, against a grade of 2 per cent. at 25 m.p.h., but 14 cars can be taken in emergencies. In continuous service the locomotive is designed to operate at 42,000 lb. tractive effort at a speed of 27 m.p.h. The total weight supported on the driving axles is practically the same as that on the present geared passenger locomotives, weighing a total of 300 tons. The table below gives the principal dimensions, weights and capacity of the gearless locomotive :—

Length inside knuckles ..	76 ft.
Length over cab	68 ft.
Total wheelbase	67 ft.
Rigid wheelbase	13 ft. 11 in.
Diameter, driving wheels ..	3 ft. 8 in.
Diameter, guiding wheels ..	3 ft.
Weight, electrical equipment	117½ tons.
Weight, mechanical equipment	147½ tons.
Weight, complete locomotive	265 tons.
Weight on drivers	229 tons.
Number of motors	12

Control equipment is similar in most respects to that used on the original locomotives which have now been in service for nearly four years, modified as required to comply with the different arrangement of motors. Advantage is taken of a new scheme of connections by means of which four of the main locomotive motors are utilised to furnish exciting current during regeneration, thus reducing the size of the motor-generator set used for control, accessories and train lighting. The gearless locomotive shows a much better efficiency at high speeds than the geared type owing to the elimination of the gear drive. In passenger service, where there are long stretches of level track and stopping points are comparatively few, a much higher efficiency is obtained in all-day service. These curves show an efficiency at 50 m.p.h. approximately 10 per cent. higher than for the geared type of locomotive.

In the centre cab is an oil-fired steam boiler for heating passenger trains, together with accessories, including tanks for oil and water, circulating pumps and a motor-driven blower for furnishing forced draught. A slider pantograph, similar in construction to those now in use, is mounted on each of the operating cabs. This pantograph has two sliding contacts, giving a total of four points per slider with the double trolley. The pantograph and flexible twin trolley construction enable the locomotives to collect currents as high as 2,000 amperes at speeds up to 60 m.p.h., without noticeable arcing at the contact points. The second pantograph is held in reserve as a spare.

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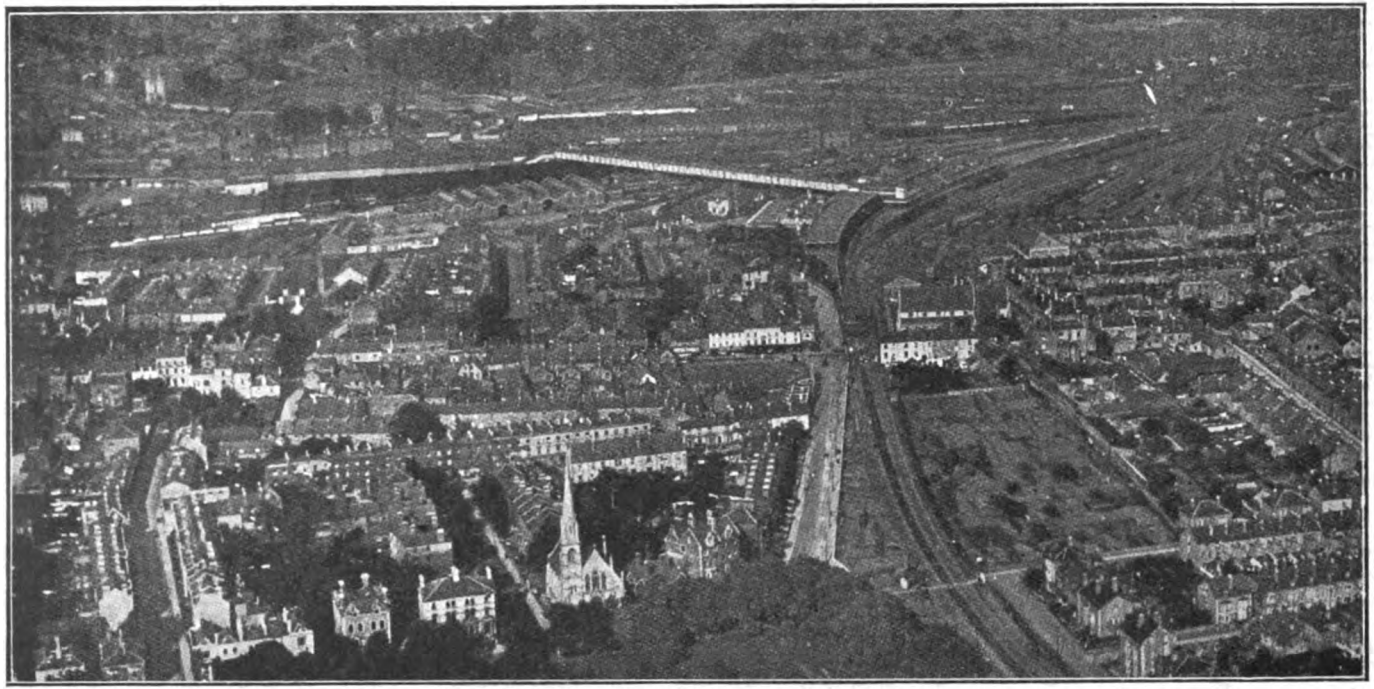
AERIAL PHOTOGRAPHY AND RAILWAYS.



A STRIKING VIEW OF THE TOWN OF GLOUCESTER.

The Midland & Great Western Railway stations are clearly shown, also the footbridge connecting them, and the Midland goods yard, engine sheds, &c.

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Aerial Photography and Railways.

A new application of photography from the air which offers great possibilities.

FOR war purposes photographs of railway stations, buildings and lines from aeroplanes figured prominently in aerial reconnaissance; but it is not at once obvious as to how this branch of work can be directly useful for railway purposes, especially in areas which are already well mapped, and where required geographical information is available from older sources.

The subject is, however, receiving careful attention, and, as will be seen, there are distinct possibilities of usefulness. For example, apart from actual technical value, a photograph taken from above readily conveys a great deal more information of a general character as to the location of approach roads, adjacent buildings, and the characteristics of the immediate vicinity than are afforded by drawings and plans, especially where a series require to be consulted to cover the same area. In times of peace, too, the views can be taken at relatively low altitudes, so that a considerable amount of material is revealed in comparative detail.

REDHILL STATION, SOUTH EASTERN & CHATHAM RAILWAY.

For parliamentary and legal purposes such photographs will undoubtedly possess great value in the future, while the traffic officer may be materially assisted by being enabled to view extensive premises as a collective whole instead of

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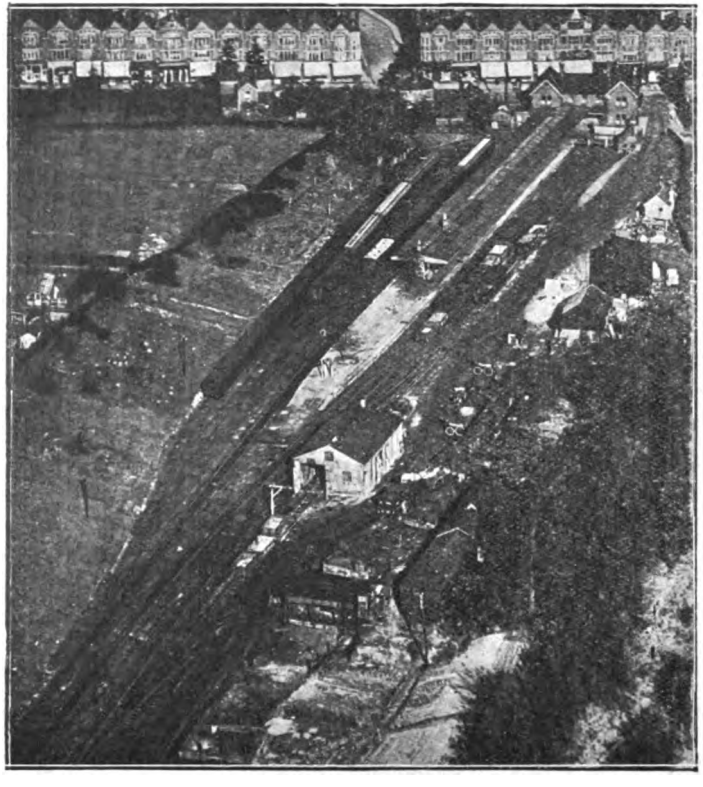
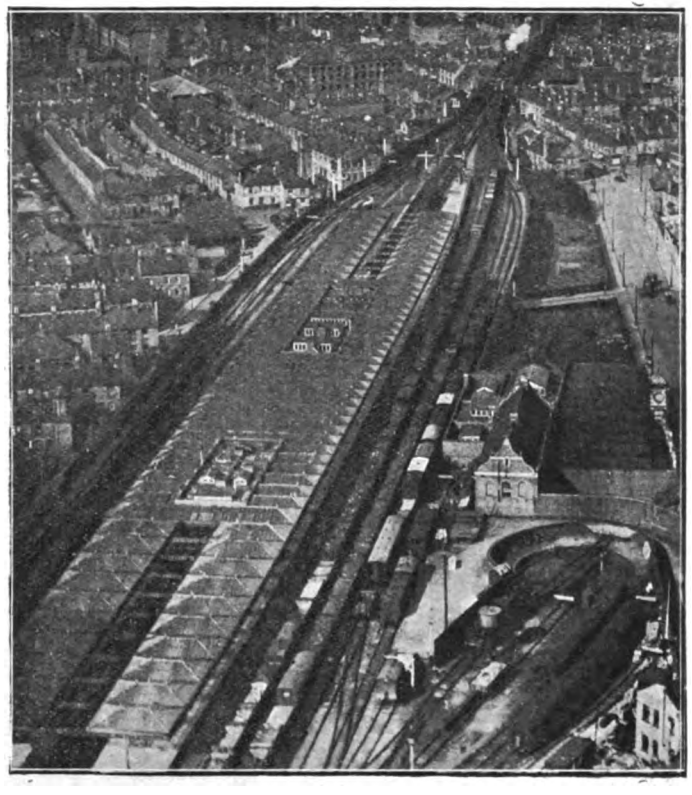
AERIAL PHOTOGRAPHY AND RAILWAYS.



GREAT NORTHERN RAILWAY STATION AT ENFIELD.
This station, closed since the opening of the Cuffley line, is utilised for storing coaching stock. The goods yard is still in service.



GREAT CENTRAL RAILWAY STATION AT LEICESTER.
Showing the main island platform, through roads outside, goods sidings, and turntable in locomotive depôt.

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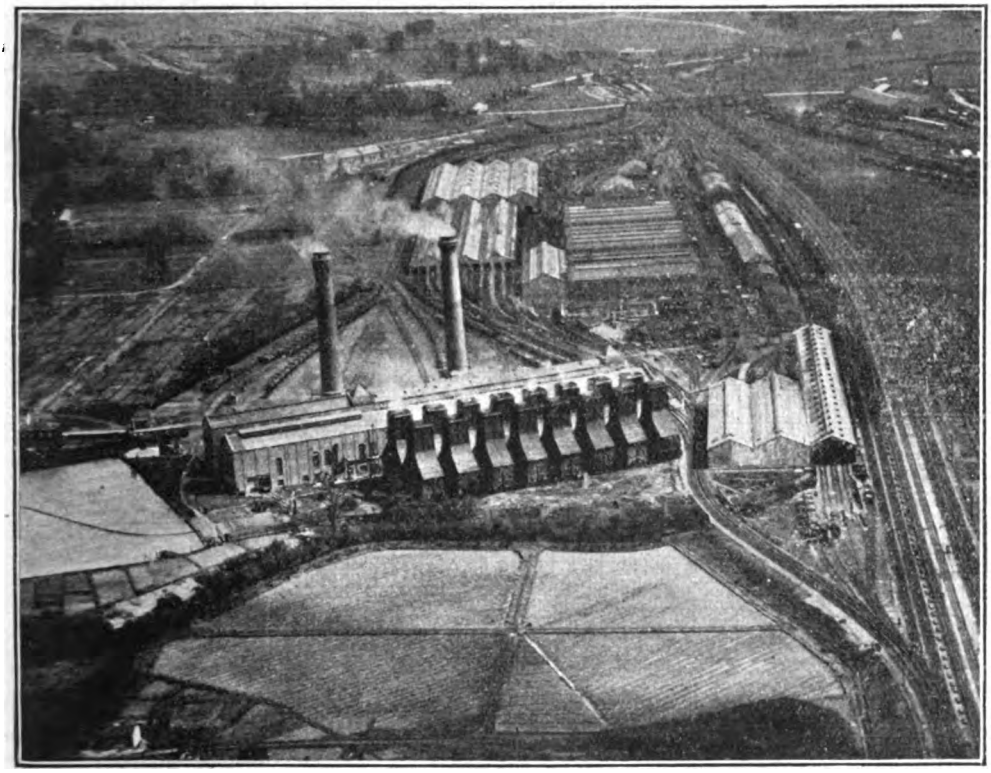
piecemeal as usual. It is possible, indeed, for aerial photographs to supply, virtually, pictorial plans taken approximately vertically from above.

A further field of usefulness is that of railway surveying prior to the laying of lines in new country, and especially in selecting the most suitable routes where nature offers many obstacles and the railway pioneer company can do with any assistance which will render their difficult tasks more easy of accomplishment.

details regarding aerial photography, and to illustrate this article with views of railway interest reproduced from photographs taken specially for the purpose.

Probably the most useful aerial photographs are those known as "Overlaps" and "Mosaics." An "Overlap" is a series of photographs taken from an aeroplane at regular intervals of a few seconds, so that each photograph overlaps the preceding one, thus forming a continuous strip photograph of the ground flown over.



GENERATING STATION, LOCOMOTIVE AND CAR SHEDS, NEASDEN, METROPOLITAN RAILWAY.

The Aircraft Manufacturing Company, Limited, is a firm which is specialising in aerial photographs for commercial purposes. This company has a department, staffed by experts demobilised from the R.A.F., devoting its energies exclusively to commercial aerial photography, and many excellent examples of their work have been acquired by large firms and corporations for advertising and publicity purposes. By their courtesy we are able to publish the following technical

If further strips be taken so that their sides overlap the first the result, when pieced together, is a photographic map. These photographic maps are known as "Mosaics"—from the patchwork appearance the fields and hedges usually present—and can be produced to any desired scale.

Aerial photographs taken to give a plan view of the ground are known as "Verticals," and according to the lens used they can be made to include practically

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any desired angle of view from any given height. For instance, at 1,000 ft., with a 10-in. lens, the image of an object 500 ft. long on the ground would just fill the plate. If, still at 1,000 ft., a 5-in. lens is used, the image of the same object would occupy 2½ in. on the plate. For military purposes the majority of aerial photographs were "Verticals," but great use was also made of "Obliques." "Oblique" photographs were generally taken at an angle of 11 deg. under the horizontal, the resulting picture being in the nature of a side elevation of the object photographed. These indicated to the artillery and others the contour of the ground in front and the general lie of the land. As "Obliques" have a more pleasing aspect and present a point of view rarely shown otherwise it seems likely that in ordinary commercial work this method will be in greater demand than "Verticals." But to secure the full benefit of aerial photography it will be advantageous to employ both methods in conjunction.

The view of Gloucester shown on page 44 gives a good impression of the wider possibilities afforded. There is not so much detail as in other views reproduced seeing that the stations are more distant; but the Midland station and track are well shown, together with the goods yards, sidings and engine sheds; while the connecting footbridge to the Great Western station stands out very prominently.

The photographs of the disused station at Enfield, Great Northern Railway, superseded by the new station provided when the section of the Enfield-Stevenage route to Cuffley was opened, and now only used for stabling and goods yard purposes, gives comparatively complete detail; while the view of Leicester, Great Central, station, has a distinctly useful completeness.

Redhill Station, South Eastern and Chatham Railway, is still more complete in detail, seeing that the platforms are not roofed from end to end, so that the information conveyed is relatively ample.

By courtesy of the Metropolitan Railway we are also able to reproduce a view of another type, showing the power station, carriage sheds, and workshops at Neasden.

FIFTY YEARS OF RAILWAY LIFE IN ENGLAND, SCOTLAND AND IRELAND.

By JOSEPH TATLOW.

IN this volume are given the recollections and experiences of a man who began his railway career as a junior clerk more than half a century ago; was afterwards in the service of various railways, great and small, in England, Scotland and Ireland; attained at a comparatively early age to the position of general manager; is now a railway director; has, in his time, mingled much with railway men from the highest to the lowest; has seen and heard much and had much to do in connection with railway promotion, construction and working, and with railway matters generally. A pleasant thread of personal narrative runs through his pages, the author has imparted an amount of practical information which should be helpful to the younger members of the railway service. Everyone interested in railway working should possess a copy.

Cloth, price 10s. net. Post free, 10s. 6d.

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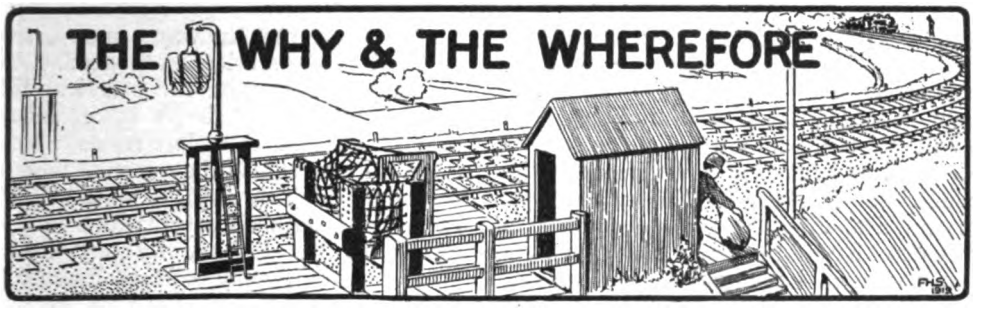

RAILWAY MAGAZINE readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o RAILWAY MAGAZINE, 30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book," for the current year. Price 5s. By post 5s. 9d.

Taff Vale Railway Locomotives.

By courtesy of Mr. J. Cameron, Locomotive Superintendent, we are enabled to give particulars of the classification of locomotives in use on the Taff Vale Railway :—

0-6-2 *tank engines.*—5 ft. 3 in. coupled wheels, Classes "A," "U" and "U1"; 4 ft. 6½ in., coupled wheels, Classes "O," "O1," "O2," "O3," "O4," "N" and "M1." Of these Class "A" have 18½ in. cylinders, the others being 17½ in. by 26 in. stroke. Steam pressures are: Class "M1," 140 lb.; Classes "N," "O" and "O1," 150 lb.; Classes "U," "U1," "O2," "O3," 160 lb.; and Classes "O4" and "A," 160 lb., though as new boilers have been or will be fitted the pressure is raised to 175 lb. Class "U1" differs from Class "U" in having a modified radial gear.

4-4-2 *tank engines.*—Class "C," 17½ in. by 26 in. cylinders, 5 ft. 3 in. coupled wheels, 160 lb. steam pressure.

0-6-0 *tank engines.*—Class "V," saddle-tank shunting, 4 ft. 6½ in. coupled wheels; Class "H," side-tank "climbing," 5 ft. 3 in. coupled wheels. Both have 17½ in. by 26 in. cylinders; but the steam pressure of the former is 150 lb., of the latter 140 lb. Class "D" engines, are double-framed saddletanks, with 16 in. by 24 in. cylinders, and 4 ft. 3 in. coupled wheels; while Class "E" are saddletank locomotives converted from 0-6-0 tender engines, having 17 in. by 24 in. cylinders and 4 ft. 7½ in. coupled wheels. Both use a steam pressure of 130 lb.

0-6-0 *tender engines.*—Classes "K" and "L," 17½ in. by 26 in cylinders, 4 ft. 6½ in. coupled wheels, steam pressure 140 lb.

4-4-0 *tank engines.*—Class "I," 16 in. by 24 in. outside cylinders, 5 ft. 3 in. coupled wheels.

0-4-0 *saddle-tank shunting engines.*—Class "S," 10 in. by 16 in. cylinders, 2 ft. 11 in. coupled wheels, 130 lb. steam pressure; Class "T," 8¼ in. by 14¾ in. cylinders, 2 ft. 6 in. coupled wheels, 120 lb. steam pressure.

The numbers of engines of each class now in service are: "A" 30; "O4," 41; "O3," 15; "O2," 9; "O1," 14; "O," 6; "U," 7; "U1," 8; "N," 10; "M1," 41; "C," 6; "V," 6; "H," 3; "K," 39; "L," 6; "I," 3; "D," 3; "E," 2; "S," 1; "T," 1.

[Reply to H. W. OGG.]

The First "Mallet" Locomotives.

Articulated engines of the Mallet type, really the compound adaptation of the Meyer type, in that the rear set of coupled wheels (operated by the high-pressure cylinders) are carried by the main frames, while the leading set of coupled wheels (low-pressure cylinders) are mounted in a swinging frame pivoted to the front of the main frames, date back to about 1876, though the first engine was not built until 1887. Mons. Anatole Mallet, the "father of the compound locomotive," was engineer

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to the Bayonne and Biarritz Railway, in the south of France. His first articulated engines were of small classes for use on light industrial lines in France, but later on the system was applied to quite large locomotives in Europe and various foreign countries. The type was further developed in America, where very large numbers of this class have been built since 1903, and the name of its French originator has continued in general use. It is now applied, occasionally, to similar engines wherein all cylinders use high-pressure steam; but until comparatively recently all engines having the Mallet division of the frames into a main and a hinged portion were compound, and by far the largest number of them still retain this method of working.

[Reply to J. MALLET.]

Highland Railway Locomotives.

We are not aware of any complete history of Highland locomotives published in book form, though a small brochure, "Behind the Highland Engines," was issued from the offices of the *Inverness Courier* some years ago. The locomotives of this interesting line have, however, received very full attention in the RAILWAY MAGAZINE from time to time, and we may refer specifically to articles published: March, 1913, "Highland Locomotives and their Work," and August, 1915, "Jubilee of the Highland Railway," though both of these issues, together with others of earlier date, are now out of print. Our contemporary, *The Locomotive Magazine*, has also dealt with these engines very fully in the past. The Highland Railway commences at Stanley Junction and not at Perth, the intervening section being Caledonian property, over which the Highland Company exercises running powers.

[Reply to G. MACDONALD.]

Routes to Barnard Castle.

Ordinarily the only route from London to Barnard Castle is via the Great Northern and North Eastern Railways, though it is, of course, possible also to travel by the London and North Western Railway via Tebay, or by changing stations via the Midland Railway at Appleby or Kirkby Stephen. The problem then is one of making connections, while it would sometimes be necessary to change once or twice to obtain a service to the station whence access is obtained to the branch of the North Eastern Railway upon which Barnard Castle station is situated. You can only decide upon the practicabilities of such alternative routes by consulting time-tables and selecting trains accordingly. There is also the question whether you could book through, or would require to re-book intermediately, in which case you can make the journey by any desired route. [Reply to R. G. BAILEY.]

0-6-0 Locomotives, Midland Railway.

Particulars of the rebuilding of the "2900" class with small Belpaire boilers were given in the RAILWAY MAGAZINE last December, No. 2933, as reconstructed, being illustrated by the frontispiece to that issue. We cannot say what will happen to any particular engine; but as far as practicable engines rebuilt are fitted with one or other of the standard series of boilers, the most suitable pattern being adopted according to the dimensions rather than of the classification of the engines concerned. You are correct in stating that many of the so-called rebuilt 4-4-0 locomotives are virtually new engines, and your remark that the new Nos. 428–482 have 7-ft. coupled wheels, although they nominally perpetuate 6 ft. 6 in. engines of the same numbers, is noted.

[Reply to H. R. GALE.]

Bedford-Hitchin Branch, Midland Railway.

This line is part of the South Midland Railway, extending from Wigston to Hitchin, whereby the Midland secured entrance to London over the Great Northern Railway, as an alternative to the route previously adopted *via* Rugby and the London and North Western Railway. When the Midland built their own line from Bedford to London the Bedford-Hitchin section became in the nature of a branch. It remained double-track, however, for its local traffic was by no means unimportant, until the war period, during which it was one of the lines selected for conversion to single-track to allow of permanent-way being lifted and sent overseas.

[Reply to "MARKET GARDENER."]

The Heaviest Express Locomotives.

As a further reply to this well-worn query we may say that, after the Great Western Railway *Great Bear*, which weighs 96 tons in working order without tender,

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comes the re-built London and South Western Railway 4-6-0 No. 335, which weighs 79½ tons, or with tender 140 tons. The 482–491 4-6-0 series of the same company weigh 79¼ tons each without tender. Strictly speaking the London, Brighton and South Coast Railway 4-6-4 engines of the "Charles C. Macrae" class should be regarded as express locomotives, though they are tank engines; their weight in working order is the same as that of the Great Western Railway engine, viz., 96 tons.

[Reply to W. J. PEARKS and "HAMPTONIAN."]

A Remarkable Railway Project.

It is, of course, the Lancashire, Derbyshire and East Coast Railway to which your guide-book refers. This line was intended originally to run from Manchester to Louth, but was never made beyond Chesterfield in the westerly, and Lincoln in the easterly direction. It is now included in the Great Central Railway. The Chesterfield—Manchester section, which was to run *via* Tideswell, Buxton and Glossop, would have been exceedingly costly to construct, including a viaduct 272 ft. in height above the Midland viaduct at Miller's Dale, and a tunnel under Goyt's Moss, Buxton, 4,210 ft. in length.

[Reply to A. R. COWLISHAW.]

Liverpool-Gloucester Train Service.

It is very doubtful whether many of the through coach services which operated before the war will ever be restored to the time-tables. Many of them were, on the average, very poorly patronised, and must have proved a substantial loss on the year's working, taking into account the cost of their haulage, and the time and trouble occasioned in marshalling them on and off the trains. Your journey from Liverpool to Gloucester is a case in point; we should very much doubt if the number of tickets issued for this particular journey averaged as much as one a day in each direction throughout the year.

[Reply to "ORMSKIRKIAN."]

Littlehampton and the "Brighton" Line.

The Pulborough-Ford Junction section was authorised July 23, 1860, and opened for traffic August 3, 1863, the branch to Littlehampton, authorised at the same time, being brought into use August 17, 1863. A considerable traffic was operated from Littlehampton to Honfleur and the coast of Normandy and to the Channel Islands until transferred to Newhaven. The Bognor branch was authorised July 11, 1861, and opened October 1, 1864. The Battersea Wharf line was authorised August 4, 1853, and opened for traffic April 30, 1862.

[Reply to F. W. SIMMONS.]

The Victoria and Pimlico Railway.

In order to clear up the query you raise enquiry has been made of the London, Brighton and South Coast Railway, and the following reply has been received:—"The terminus at Battersea was opened in connection with the Crystal Palace, West End and Battersea Railway in 1853. The Pimlico Railway was an extension of the Crystal Palace and West End Railway from Battersea to Victoria. The site occupied, therefore, by the present Victoria Station was the original site of the Pimlico Railway terminus opened in 1860."

[Reply to W. J. S.]

Sleeping Cars, London and South Western Railway.

We are obliged for your remarks, which are confirmed officially, pointing out that the sleeping cars introduced some years ago by the London and South Western Railway for their special trains from Plymouth to London with Trans-Atlantic passengers were taken over by the Great Western Railway. Two are still running, altered in detail to agree with Great Western practice, and painted in their standard livery, the other two having been burnt as a result of a fire in the paint shop at Swindon.

[Reply to W. L. SPARKES.]

Passenger Train Load Ratings, Midland Railway.

On the fastest trains the load ratings for classes 1, 2, 3 and 4 respectively are 170, 200, 220 and 260 tons London to Leicester and Trent and Nottingham to Leeds; 10 tons less from Kettering to Nottingham and 10 tons more from Leicester to Derby; 150, 180, 200 and 230 tons from Derby to Manchester and Leeds to Carlisle, and the same with the addition of 10 tons in the case of Class 4 engines from Bristol to Derby. In the case of the slower trains there is no limit in reason to the loads.

[Reply to "SINGLE-WHEELER."]

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Permanent Way Cautions.

Circular raised signs of opaque white glass, enclosing the letters "C" or "T," respectively, are used in connection with repairs to the track or other similar work involving reduction of speed. "C" indicates the point where the slack commences, and "T" where it terminates. The arrow-shaped board, painted dark green and exhibiting green and white lights at night, also indicates the commencement of a permanent-way slack, but is gradually being superseded by the signs previously mentioned.

[Reply to CHAS. V. YOUNG.]

0-6-4 and 4-6-4 Tank Engines, Midland Railway.

Of the former class the majority are engaged on passenger service in the Manchester district, although a number have now been transferred to the Normanton area for mineral working; the 4-6-4 tanks are employed exclusively on goods and mineral service between Wellingborough and Brent Sidings, Hendon. Small numbers at the bottom of the smoke-box doors on Midland engines indicate the shed numbers.

[Reply to "MIDLANDIAN."]

Indian Mail Trains.

Presumably you refer to the special trains run from Calais to Brindisi in connection with Peninsular and Oriental steamers for India. The Peninsular Limited Express was a special *train de luxe*, while the Indian mail train duplicated its schedules but took no passengers. The route followed was by the Northern Railway to the outskirts of Paris, thence by the "Grand Ceinture" line to the Paris-Lyons-Mediterranean Railway.

[Reply to H. V.]

Mail Apparatus Warning Boards.

White-painted erections consisting of three horizontal boards, fixed to two uprights, at the side of the line on the London and North Western Railway, are the warnings to the sorting staff on mail trains to prepare for exchanging mails, *i.e.*, to extend the net on the sorting carriage, and swing out the arms carrying the bags for delivery. The boards are usually fixed a quarter of a mile or so ahead of the mail apparatus.

[Reply to BRIAN BRAMALL].

Speed Restriction, Great Western Railway.

During the latter part of the war and until recently a restriction to a maximum of 60 m.p.h. was imposed on all trains on the Great Western Railway. We do not know if this has been finally withdrawn yet, but it is evident from the descriptions of current Great Western locomotive performance appearing in Mr. Cecil J. Allen's articles that the restriction is no longer enforced with any rigour.

[Reply to A. V. H.]

South Acton Junctions.

The connection between the North and South West Junction and Metropolitan District Railways is occasionally useful for special purposes, but was made, we believe, with a view to giving access to proposed coal depôts on the Metropolitan District Railway, to be served from Willesden, though the project has not matured and the junction is closed.

[Reply to N. J.]

Piloting on the Midland Railway.

As the 10.50 a.m. from St. Pancras to Glasgow was, until its recent acceleration, a train of very slow timing, it was allowed to take full load, whereas the load of the 10.15 a.m. to Manchester is limited to 260 tons tare for a compound (Class 4) locomotive, when running unpiloted. This would account for the piloting to which you refer.

[Reply to "DERBY."]

Baldwin Locomotive Works.

The Baldwin Locomotive Works were founded by Matthias Baldwin in 1837, so that it is one of the oldest established businesses dealing with locomotives in the world, as well as being probably the largest which has not been formed as a result of the combination of several concerns already operating on a considerable scale.

[Reply to J. MALLET.]

R.O.D. 2-8-0 Locomotives on the Great Eastern Railway.

A number of these familiar engines have been taken over by the Great Eastern Railway for goods and mineral service between March and York *via* the Great Northern and Great Eastern Joint Line. If you will read the rules you will see that we do not answer questions relating to locomotive numbers.

[Reply to GEOFFREY CHRISTY.]

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West Sussex Railway.

This is now the statutory name of the Hundred of Manhood and Selsey Tramways, authorised to be worked by the West Sussex Light Railway Order of 1915. This Order also authorises an extension to Itchenor Quay, at the mouth of Chichester Harbour, and gives powers to erect jetties, etc., at that point. Our readers know this line best under its old name, or as the Chichester and Selsey Tramway, of which Mr. G. M. Jenkins is Secretary and Manager, and Lt.-Col. H. F. Stephens, M.Inst.C.E., Engineer and Locomotive Superintendent.

[Reply to W. P.]

Disc Signals.

Your query is not understood. Disc signals—the small revolving signals with disc faces, used for cross-overs and in sidings—still remain in extensive use on nearly every railway, though modern practice tends rather towards dwarf semaphore and "banner" signals for similar purposes.

[Reply to R. N. RUSSELL.]

Voltage on London Electric Railways.

IN the case of the Metropolitan, Metropolitan District, London Electric and London & South Western Railways, direct current at 550-600 volts is used. On the London, Brighton and South Coast Railway alternating current is supplied to the overhead conductors at 3,500 volts.

[Reply to "JUICE."]

Rolling-Stock, Furness Railway.

Until recently passenger coaches of this line were painted blue with white upper panels, so that the general appearance would be not unlike that of London and North Western Railway vehicles. Now, however, the standard colour is, as stated in the RAILWAY YEAR BOOK, blue without the white upper panels.

[Reply to M. L. G. B.]

Maximum Midland Speeds.

A top speed of 96 m.p.h. was once recorded by the late Mr. Charles Rous-Marten when travelling behind one of the 4-4-0 compounds on the descent from Ais Gill to Settle. Presumably you refer to the "1,000" class, which at present include only the three-cylinder compound locomotives already mentioned.

[Reply to T. H. WARDLE.]

Naming of London and North Western Express Locomotives.

We assume that this practice was discontinued during the war in order to avoid the expense of preparing the brass name-plates and the beading round the splashers; but we are informed that with the "Claughton" class engines now building at Crewe, naming is to be resumed.

[Reply to "CLAUGHTONIAN."]

London and North Western Railway Running Lines, Rugby-Crewe.

Between Rugby and Crewe the line is mainly, but not exclusively, four-tracked with the fast roads in the centre; from Crewe to Stafford there are four tracks throughout, with the fast roads on the eastern side—a reversal of the conditions from London to Roade.

[Reply to BRIAN BRAMALL.]

Locomotive Classes, London and North Western Railway.

There are nearly 40 locomotive classes on the London and North Western Railway, and we have no space to give them in full. We suggest that you apply to Mr. C. Williams, 73, Chetwode Street, for copies of his lists of locomotives on this line.

[Reply to R. H. BRAY.]

Chimney Capuchons.

Capuchons, or raised lips, in front of the chimneys of Midland, Great Western, North Eastern and other companies' engines are intended to deflect the exhaust steam in such a way as to lift it clear of the front windows of the driver's cab.

[Reply to A. F. F.]

Drummond 4-4-0 Engines, Glasgow and South Western Railway.

All these locomotives have 6 ft. driving wheels, both the superheated and non-superheated classes. The former are the heaviest 4-4-0 engines in Scotland, weighing without tender a fraction under 62 tons in working order.

[Reply to HENRY FORDER.]

London-Nottingham Runs, Midland Railway.

There is no intermediate stop between Nottingham and London in the case of the 4.31 p.m. *ex* Nottingham or the 9.15 a.m. *ex* St. Pancras. The 8.25 a.m. from Nottingham calls at Manton (9.9-9.12 a.m.) and is due in London at 10.59 a.m.

[Reply to J. C. SEARLS.]

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"Claughton" Class Engines, London and North Western Railway.

There is no invariable rule as to the working of these engines, and in general they take their turns with 4-4-0 and 4-6-0 engines of the "George the Fifth" and "Prince of Wales" classes respectively.

[Reply to "CLAUGHTONIAN."]

Tail Lamps on Light Engines.

Obviously a light engine or light engine and brake must carry a tail lamp as a "train" is thus constituted for traffic purposes, and the red light in rear is equally necessary to ensure observation and to indicate that the train is complete.

[Reply to J. V. HILL.]

"1500" Class Engines, Great Eastern, Railway.

We do not undertake to give locomotive dimensions in these columns, but as a special case may state that these engines weigh 64 tons in working order, without tenders.

[Reply to S. DIESCH.]

Elliptical-Roofed Midland Stock.

A large number of the new elliptical-roofed Midland coaches are now in service; we do not know what you mean by "perpendicular sides," as all these coaches have the usual curve-sided bodies.

[Reply to "MIDLANDIAN."]

London to Weymouth by Great Western Railway.

Beyond the main line from Paddington to Reading, the only other four-tracked stretches on this route are very short ones through such stations as Newbury and Westbury.

[Reply to "CUT-OFF."]

Great Western Railway Locomotives.

Stars, crescents, and other objects painted or polished on smoke-box doors are usually decorative efforts on the part of drivers or cleaners, and have no traffic significance. [Reply to J. A. LITTLE.]

Light Engines at Speed.

As a rule engines travelling alone are not allowed to run at high speed as they are relatively unstable when not steadied by a load. Generally the highest speeds are made with a fair or heavy load attached.

[Reply to J. H.]

Letchworth Garden City Station, Great Northern Railway.

This station was opened for traffic, April 15, 1905. As far as we are aware the station now in use is that originally built. [Reply to H. V.]

Lancashire and Yorkshire Railway Locomotives.

Both the 4-4-2 and 4-6-0 locomotives of this railway are now receiving attention in regard to the fitting of superheating apparatus.

[Reply to J. W. W.]

London and South Western Railway "Overseas" Locomotives.

Engines of this company undertaking overseas service during the war were exclusively of 0-6-0 Drummond and Adams tender types.

[Reply to "SOUTH WESTERN."]

Clapham Junction, London and South Western Railway.

No express trains between Waterloo and the West of England call at Clapham Junction in either direction.

[Reply to R. W. HANBIDGE.]

The "Great Silence," November 11, 1919.

In common with all other trains, the Great Western Railway "Cornish Riviera" express was stopped at the appointed time on this date.

[Reply to J. A. LITTLE.]

Three-Compartment Coaches.

There may be still in existence a few very old coaches, consisting only of three compartments, but we are not aware of any at present running.

[Reply to R. N. RUSSELL.]

Great Western Railway, 4-2-2 Express Engines.

There are no engines of this wheel arrangement now remaining on the Great Western Railway.

[Reply to S. DIESCH.]

0-10-0 Engine No. 2290, Midland Railway.

This engine has a considerably higher nominal tractive effort than "The Great Bear" on the Great Western Railway.

[Reply to "MIDLANDITE."]

R.O.D. 2-8-0 Locomotives on the Great Western Railway.

We are constantly asked this question. See April RAILWAY MAGAZINE, page 261.

[Reply to "KIKI."]

A Midland Locomotive Query.

The apparatus to which you refer on the right-hand side of a Midland engine is an exhaust steam injector.

[Reply to W. S. UPTON.]

Inside-Cylinder 4-4-0 Tank Engines, North London Railway.

A number of these engines are still at work, in addition to No. 109.

[Reply to J. A. DICK.]

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The Railway Challenge Shield.

ALEXANDRA DOCKS AND RAILWAY ARE VICTORS IN THE ST. JOHN AMBULANCE ASSOCIATION COMPETITION.

IN no walk in civil life is ambulance work of greater importance than in the railway service, and fortunately it is there keenly supported by directors, officers and staff. The St. John Ambulance Association provides a Railway Challenge Shield, and its possession is no mean honour for the winning team.

This year, after a preliminary competition, nine teams gained the right to take part in the final, which was held at the Pillar Hall, Cannon Street Hotel, London, with the following result :—

1. Alexandra Docks and Railway, 268 marks; 2. South Eastern and Chatham Railway, 228 marks; 3. London and North Western Railway, 218 marks; 4. Great Central Railway, 199 marks; 5. North Eastern Railway, 184 marks; 6. London and North Western and Furness Joint Railway 175 marks; 7. Lancashire and Yorkshire Railway, 136 marks; 8. Cheshire Lines Committee, 104 marks; 9. Great Northern Railway, 98 marks.

The competition for the Railway Challenge Shield was inaugurated about 25 or 30 years ago, and has been held each year, with the exception of the recent war period. The competition is regarded as being the most exacting of any arranged under the auspices

ALEXANDRA (NEWPORT AND [SOUTH WALES] [DOCKS] AND RAILWAY AMBULANCE TEAM, 1920.

Names left to right :—*Standing*—B. Crocker (reserve), W. R. Minns, C. Marshall, T. P. Marshall. *Sitting*—D. G. Phillips (Captain), J. Marshall.

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of the St. John Ambulance Association, and a very high standard of work is invariably attained by the competing teams.

The actual tests were :—

Part A—(Stretcher Work).

At a country railway station a block of stone, which is being lifted from a truck with a crane, falls on the back of a man who is working in a stooping position. The man falls forward clear of the stone, strikes his forehead, and lies face downwards with arms extended. He lives half-a-mile away.

Part B—(Injuries and viva voce).

Competitor No. 1 has burst a varicose vein on the inner side of the right calf. The only man near him is quite unskilled in first-aid.

Competitors Nos. 2 and 3 are hurrying with a friend over a level crossing. The friend slips, endeavours to save himself and then falls between the rails. He complains of great pain in the left knee and is unable to rise. An approaching express train is half-a-mile away.

Competitor No. 4 sees the two patients fall from the wall and on approaching them find that blood is spurting from the right wrist of one of them.

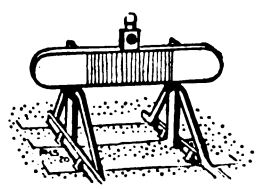
Competitor No. 5 has to show how the history, signs and symptoms serve to enable a simple fracture of the humerus 2 in. above the elbow to be distinguished from a dislocated elbow.

The ambulance classes of the Alexandra Docks were formed in 1901, and the first examination of certificates of efficiency was held in 1902. In 1903 the Alexandra Dock Company entered their team for the Railway Challenge Shield Competition, and two years later gained the extraordinary distinction, in so short a period, of reaching the top of the list of competitors and bringing the shield to Newport for the first time. This success was repeated in 1910, 1912, and again this year. One result of the great successes of the Docks competition team has been the keen interest taken in ambulance work by the employees generally, and since the classes were first formed about 150 men have gained First-Year Certificates, 75 Second-Year Vouchers, 60 have obtained Third-Year Medallions, and about 50 have on one or more occasions obtained Medallion Labels, the latter being granted for successfully passing fourth and succeeding examination. The members of the Alexandra Docks team for the present year were D. G. Phillips (captain), hoist department; W. R. Minns, police department; J. Marshall, town dock; T. Marshall town dock; C. G. Marshall, workshops; B. Crocker, traffic department, was the reserve member of the team. At the conclusion of the competition the Challenge Shield and prizes were distributed by Frances Lady de L'Isle and Dudley.

Sir Henry Mather Jackson, Chairman of the Alexandra Docks and Railway Company, proposed a vote of thanks to Lady de L'Isle and Dudley, and said that in view of the fact that the competition was open to all England and Wales, it was in the highest degree creditable that the team from the Alexandra Docks and Railway—who, in comparison with the large railways, had a smaller number of men available for selection—had distinguished themselves by winning the shield on no less than four occasions and had gained a high place in every other year since 1905.

On arrival at Newport after their victory on the evening of Friday, May 14, the team were welcomed by Mr. J. H. Vickery, the General Manager of the Alexandra (Newport and South Wales) Docks and Railway, and were entertained at a gathering of the officials of the company, Mr. Vickery occupying the chair, and being supported by Mr. J. L. Cheyne, Accountant and Secretary, Colonel T. W. R. Pearson, D.S.O. (Engineer), and other officers.

Mr. Vickery, who has taken a very great interest in, and given every encouragement to, the work of the ambulance classes generally, as well as to the preparation and training of the team, expressed his high appreciation of the honour that had been won and of the ungrudging work and sacrifice of the members of the team and reserve. He made special reference to the captain (Mr. D. G. Phillips), who had been a member of the team on each occasion that the shield had been won, and also to the work of the centre Hon. Secretary (Police Sergeant Green), who was himself a former member of the team and now assisted in instructing them. He also referred with warm appreciation to the services rendered at all times throughout the year by those members of the staff who had qualified in first-aid, and emphasised the importance and nobility of the work.



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The Value of Small Traffic Improvements.

It is usual to regard electric traction as providing not only the best, but almost as the only solution of the suburban traffic problem on railways where this is acute; but when addressing the members of the Institute of Transport, recently, Sir Henry Thornton, General Manager, Great Eastern Railway, indicated that there are still considerable reserve possibilities attaching to steam operation, and that the Great Eastern Railway is in process of realising many of them. As a result it is hoped that by making many small improvements and saving seconds at every stage a very substantial gain in traffic capacity will be secured. As he pointed out, electric traction gives superior acceleration; but in regard to entrances and exits from terminal platforms, and in the absence of flying junctions, electric trains are as liable to be delayed by other trains as in the case of steam, while the attaching of a new engine and the associated engine movements, need not adversely reduce the period of platform occupancy if smart working is provided for; the limits being set, not by the train immediately concerned, but by conflicting movements of other trains.

As the most congested section the western routes to Enfield and Walthamstow have first received attention, and in regard to the lines concerned the aid of all departments—signalling, electrical, engineering and traffic—has been enlisted for effective co-operation. Numerous small improvements have been made to facilitate the smart working required. Thus, at the terminals, coal stages, water cranes, pits, &c., have been provided at the positions where engines stand for maximum periods, assistance for engine duties is provided so that engines may always be ready to follow a train out closely, or to pass from the engine dock to a train, while the arrangement of the docks has been altered so that engines can safely enter with relative smartness, and signal clearance is quickly given to permit another train to enter the platform. It is also being arranged that engines of the same class shall be kept to each service as far as possible in order to secure uniform running, and that they shall run the same way round—chimney foremost from Liverpool Street, as they are found to pull slightly better that way and most of the down journeys are the harder.

At Liverpool Street alterations have been made so that each suburban platform in the west side station now has its own non-conflicting engine dock. Signals have been altered in position, and outer "homes" added where desirable, in order that trains may be run within close limits of block working, and checking for signals avoided unless imperative. Provision of signal reversers speeds up the signalling procedure and also assists the signalmen, while banner signals facilitate the observation of guards and platform staff at stations. By these and other measures it is hoped to increase the traffic capacity by no less than 40 per cent., without the aid of automatic signalling and notwithstanding that most of the junctions concerned are on the level. It remains to be seen how fully this result will be realised in practice; but our own observation is that the Great Eastern Railway is already approaching its old standard of punctual suburban working, although many trains have been added since the date of the Armistice. It is quite certain that the carrying out of these various small improvements will realise cumulatively a very distinct gain upon what has hitherto been practicable.

Railway Operating Results.

Statistics issued by the Ministry of Transport covering the four weeks ending February 29, 1920, afford interesting comparisons with those reviewed last month, for the corresponding period to February 1. While some little improvement is indicated in the coaching train-miles per train-hour, several other figures, such as the average train load, average wagon load, and freight train-miles per engine-hour, show slight

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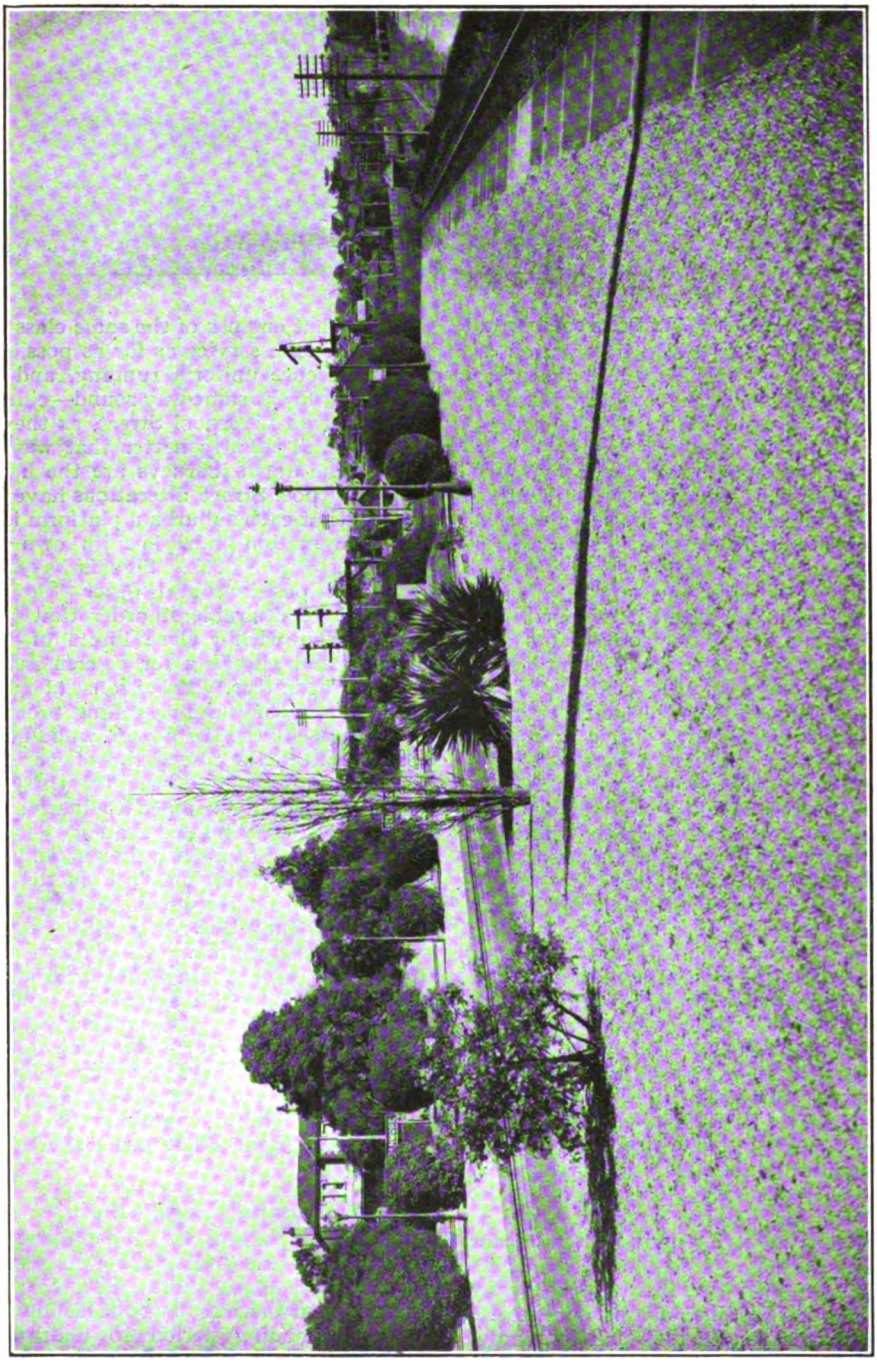

A PICTURESQUE SUBURBAN STATION IN AUSTRALIA: STANMORE, NEW SOUTH WALES GOVERNMENT RAILWAYS.

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decreases. As compared with the preceding period, there is, naturally, an increase in the receipts per ton-mile, owing to the full effect of the increased rates, which came into operation on January 15 last, on all traffic during the second period. The receipts per ton-mile, excluding collection and delivery, work out at 1.493d., as compared with 1.164d. in the preceding period. It is encouraging to notice that there has been an increase in the tonnage conveyed, and also in the average length of haul, net ton-miles being 21,397,000 or 1·38 per cent. in excess of the preceding period. Several revised figures are included in the items given for the four-weekly period ending February 1, and these have had the effect of raising many of the figures quoted last month. The average freight train load in the first case was given as 132·28 tons, but has now been amended to 134·15 tons and compares with 134 tons in the second period. The average wagon load for all standard gauge railways is similarly revised, 5·42 tons mounting to 5·51 tons for the first period and comparing with 5·43 tons in the second period.

Several new tables have been introduced in regard to the 16 principal railway companies, showing (1) the proportion of "general merchandise," "coal, coke and patent fuel," and "other minerals" traffic conveyed; (2) the average wagon load and (3) the percentage of engine-hours spent in traffic and on locomotive duties, respectively. The principal statistics of operation for a number of additional companies are also given. Total tonnage conveyed during the second four weeks was 142,965 tons, and the ton-miles, 21,397,536 (1·38 per cent.) in excess of the four weeks ended February 1.

A Picturesque Australian Suburban Station.

SUBURBAN passenger traffic in the Sydney area, served by the New South Wales Government Railways, is very heavy, and involves a very close train service at busy periods, seeing that so much of it is dealt with on what is known as the main suburban line. From the Central Station most of this traffic is concentrated upon the line to Strathfield, a distance of seven miles, the only divergence being that of the Illawarra line (and branches) which leaves the main route near Macdonald Town, the second station out. Otherwise, trains for all other routes, including the southern, western and northern main lines, use the same tracks as far as Strathfield, where the northern main line turns off, other trains continuing to Granville and Parramatta, the latter being regarded as the limit of the main suburban line proper.

Stanmore—a view of which is presented on the opposite page—is the fourth station out from Central, the distance being three miles, and it has a very heavy train service passing through it. During the slacker hours of the day stopping trains are provided at least half-hourly and often more frequently; but during the busy period about 30 trains pass through the station in each direction hourly. This section is largely four-track, and, for a distance of 1¼ miles, has also a fifth track. It is signalled automatically or by power, the McKenzie, Holland and Westinghouse Power Signal Company's electro-pneumatic apparatus being installed. By using the multiple track facilities available, trains are operated at very close intervals, as, for example, departures from the Central Station at 5.20, 5.20, 5.23, 5.24, 5.25, 5.27, 5.28, and 5.30 p.m., including expresses and fast suburban trains for outer stations and various further routes.

The general character of the climate is well set forth by the æsthetic natural decoration of the station, especially in view of its contiguity to the central districts of Sydney.

As showing the volume of suburban traffic in the neighbourhood of Sydney and Newcastle, it may be mentioned that within a radius of 34 miles from these towns, recent annual passenger train totals were: *Ordinary tickets*—First-class, 5,590,544; second-class 27,703,655; total, 33,294,199. *Numbers of season-ticket journeys*—First-class, 9,178,260; second-class, 20,025,600; total, 29,203,860. *Workmen's journeys*—22,252,644. Grand total, 84,750,703 journeys; covering an aggregate mileage of 615,870,174; average per journey, 7·27 miles.

Railway Time-Tables.

FOR a very long period the public time-tables and time-sheets issued by the various railways have been compiled upon standard principles, and there have been few variations beyond the inclusion of certain characteristics and methods peculiar to individual railways. The question may be asked, however, whether there is not scope for radical change in certain directions with a view to facilitating reference by people who are not experts and who constitute the larger proportion of users, to economise space, and to standardise time-table practice as between the various railways. There may be a few features from foreign practice which might usefully be incorporated, though as to this there does not appear to be much scope. For example, the American principle of central station names with east-bound and west-bound trains on either side, one reading upwardly, is not likely to meet with much favour here, while the relatively large number of trains concerned renders it impracticable for most of our busier lines.

In regard to good features found in

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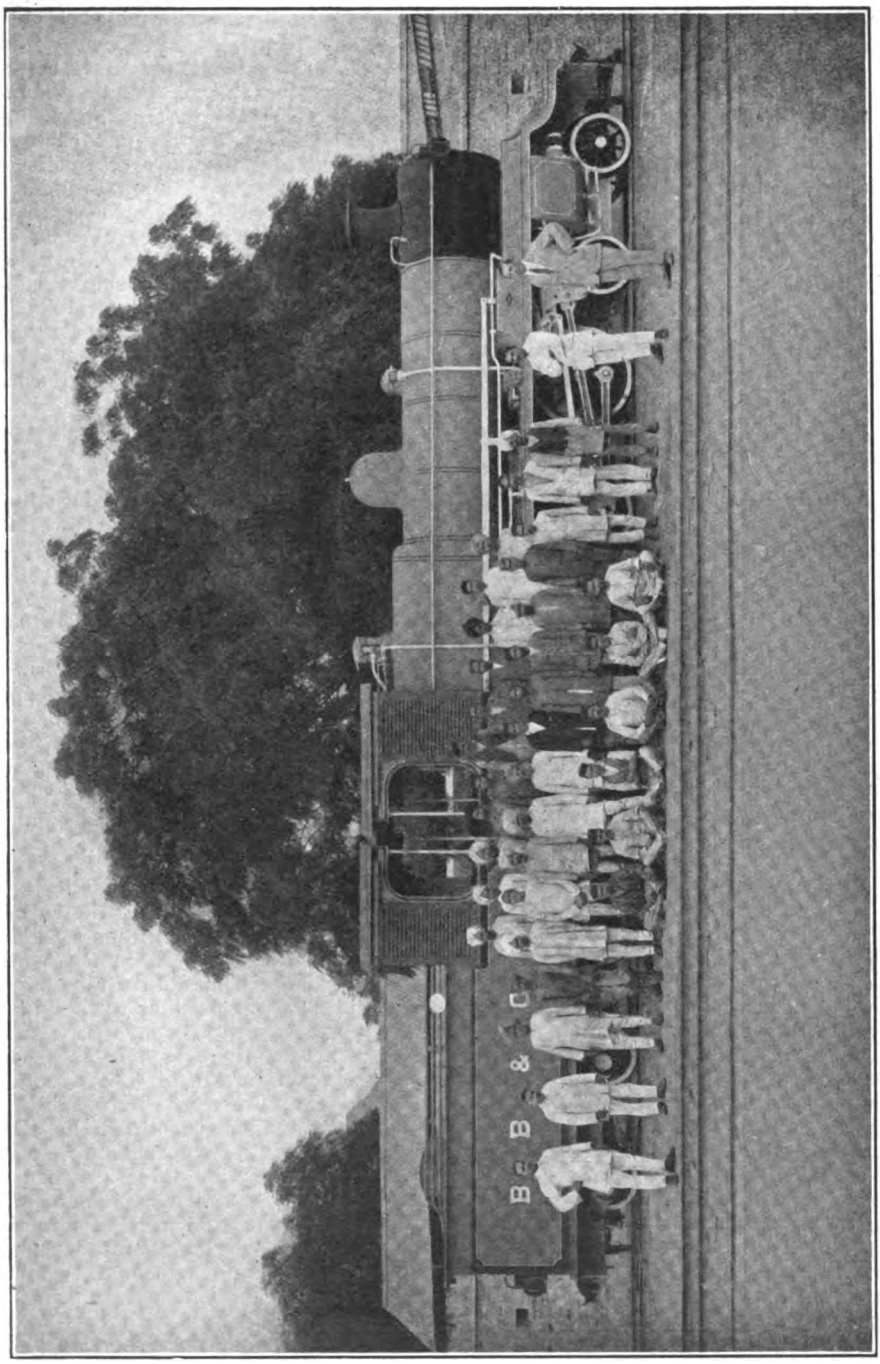

NEW 4-4-0 METRE-GAUGE LOCOMOTIVE, BOMBAY, BARODA & CENTRAL INDIA RAILWAY, WITH GROUP OF FITTERS AND ERECTORS AT AJMER WORKSHOPS.

Fitted with Wootten type boiler, superheating apparatus, Wakefield mechanical lubricator and Walschaert valve gear.

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individual time-tables we may refer to (1) the placing of station names centrally with times on either side; (2) indication of departure platforms at the principal terminus as far as practicable; (3) page references in main tables for details of branch services; (4) use of italic type for trains which do not run every week-day; (5) duplication of tables for congested periods of the day, so that at times when there are essential differences, as from 12 noon to 3 p.m. on Saturdays, and from 4 p.m. to 7 p.m. on other week-days, the user is relieved of the confusing effects due to the constant need for differentiation between "Saturdays only" and "Saturdays excepted" trains; and (6) general provision of complete series of summary tables for all principal traffic routes. Not all of these are adopted by every leading line, and desirably uniform methods should be decided upon, also in regard to the use of initial letters indicating the days upon which certain trains run, which might be extended to cover restaurant and sleeping car, or Pullman facilities.

Some Time-Table Suggestions.

It is not yet certain whether we shall have the 24-hour system for trains within the limits of the British Isles; but it would avoid one source of confusion, that due to the use of a.m. and p.m. times, and would secure uniformity between the methods of differentiation at present in force by removing the necessity for distinction. If that were done it would be a simple matter to indicate through carriage services by using a bold-faced type, so that thinner type would indicate need for changing *en route*. There would then only be occasion for special explanation in cases where the through carriage operated only between certain places.

We would also advocate, in conjunction with the extension of the summary tables, the elimination from all main tables of intermediate stations, in so far as they can legitimately be dealt with separately in sectional tables. There is a tendency on some lines to incorporate rather too much detail in main tables; instead, the main routes should be sectioned for intermediate purposes, the overall information, with principal stations only, being given in summary or main tables, with adequate references for details elsewhere. As far as possible branch tables should not appear in main tables at all, though desirably the termini thereof might be given, both for arrivals and departures, if of sufficient importance.

Speaking generally, railways which centre upon large towns have not adopted the A, B, C type of time-table, but for many travellers this is preferred, and we should like to see more done in this way. For example, the London and South Western has a neat pocket version based upon London which forms a useful addition to their standard time-books.

Several other suggestions might be offered, but for the present we leave the matter at this stage. Possibly these remarks will open a line of thought which will produce useful results, and we invite correspondence from our many readers to whom a railway time-table is an open book and who may have constructive ideas on these and kindred points.

New 4-6-0 Locomotives Built in India.

An interesting view is reproduced on the opposite page, showing a new 4-6-0 locomotive constructed at the Ajmer workshops of the Bombay, Baroda and Central India Railway (metre-gauge section), to the design of Mr. W. S. Fraser, Locomotive Superintendent, together with a group of fitters and erectors employed. The engine is specially designed to burn second-class Jherria coals, with a grate area of 26 sq. ft., giving a ratio to cylinder volume of 4·8, as compared with an average of about 3·3 in the best metre-gauge practice on the Indian railways, and considerably less on the broad-gauge lines. The boiler is equipped with super-heating apparatus and a top-feed device, and the Wootten style of firebox is adopted. Equipment includes a Wakefield mechanical lubricator, the drive for which is taken from a connection with the valve motion. Principal particulars are:—

Cylinders	16½ in. by 22 in
Heating surface tubes	740 sq. ft.
" " superheater elements	164 sq. ft.
" " fire box	96 sq. ft.
Total	1,000 sq. ft.
Grate area	26 sq. ft.
Tank, gallons	2,400
Weight, engine	38 tons
" tender	24 tons
Total	62 tons
Length of engine and tender over buffers	49 ft. 5 in.

The Central Railway of (Late) German East Africa.

Arising out of Mr. A. H. Gauld's article under this title published in the December, 1919, Railway Magazine, an interesting letter has been received from Captain A. E. West, R.E., engaged on the railway at Dar-es-Salam, amplifying and, in some respects, correcting the author's remarks. Certain differences are also due to the fact that the author was concerned with the line at a period earlier than that of which Captain West writes. The principal points raised by Captain West and contributed by Mr. Gauld in reply may be briefly summarised for completeness and accuracy.

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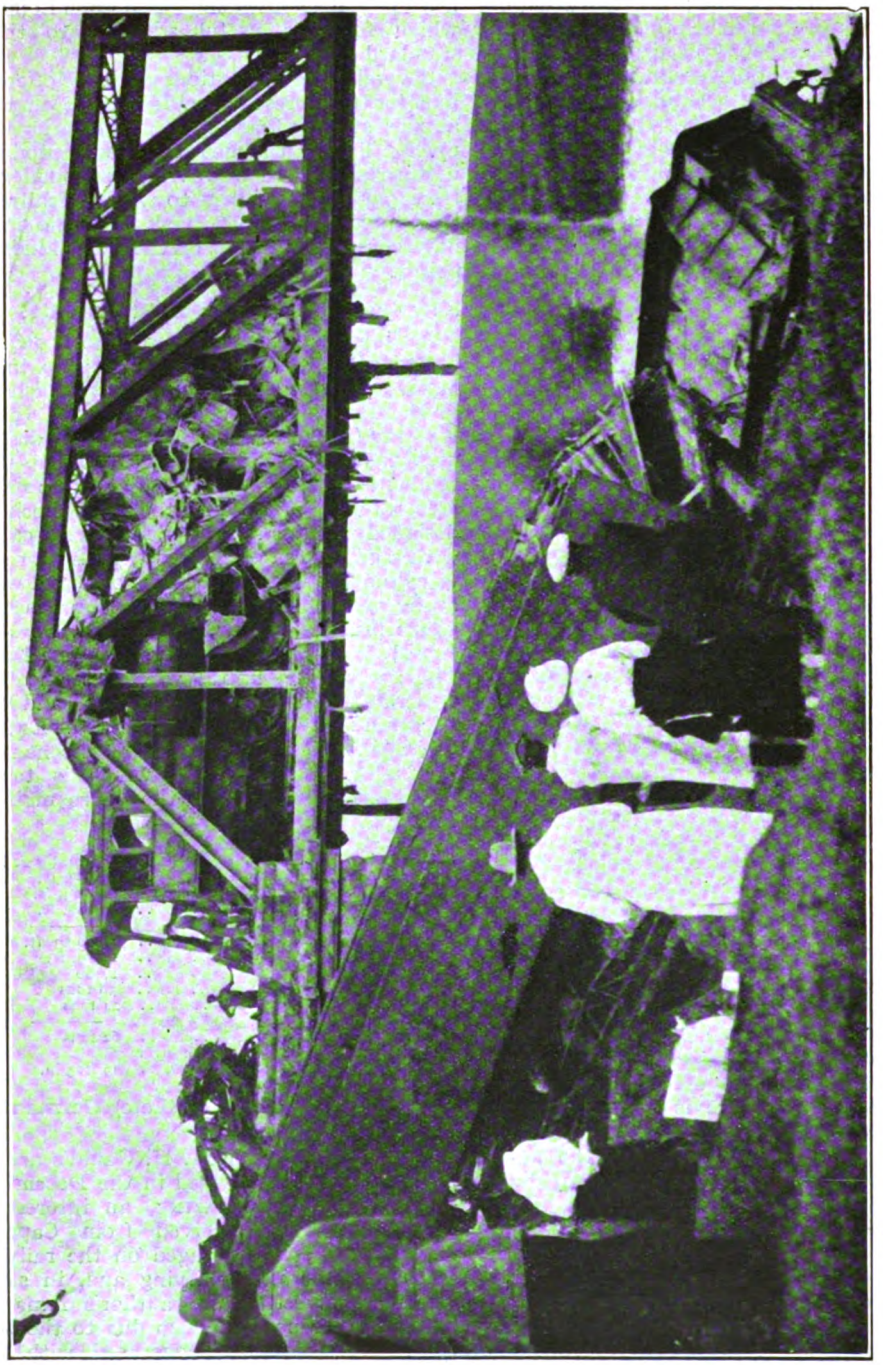

ACCIDENT TO THE DURBAN-JOHANNESBURG MAIL TRAIN ON THE SUGARBOSCH RIVER BRIDGE, NEAR HEIDELBERG, TRANSVAAL, FEBRUARY 11, 1920.

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Total length of the railway is 778 miles, and the distance from Dar-es-Salam to Tabora is 525 miles instead of 530 miles as stated. The gauge is metre, not 3 ft. 6 in. Commencing in August, 1919, a complete vacuum-braked mail train was inaugurated, and the majority of covered goods vehicles are now fitted with vacuum brake gear. Of the accidents mentioned by Mr. Gauld, one was primarily due to derailment, the breakage of a coupling being incidental, while that referred to on page 380 was the result of direct contravention of rules. Regulations for "following trains" in force are those employed on the Uganda Railway. Certain of Mr. Gauld's remarks in this connection might, perhaps, be interpreted as describing typical occurrences, whereas they represent only special conditions which arise more or less frequently, and are duly safeguarded if rules are correctly observed.

A Remarkable Railway Accident in the Transvaal.

SHORTLY before midnight on February 11, a very serious railway disaster occurred near Heidelberg in the Transvaal. Four passengers on the Durban-Johannesburg mail train were killed and 30 injured. A goods train which preceded the express had divided and left four or five wagons standing on the bridge. Fortunately, they were close to the approaching end of the bridge, so that only the engine and tender of the passenger train got on to the bridge, the first saloon crashing into the buttresses at the approach to the bridge. Had the trucks been on the further side of the bridge, and thus have allowed the whole passenger train to be on it, the result might have been even more serious, and possibly the whole train would have been precipitated into the river below.

The Durban-Johannesburg mail train travels very rapidly down the incline leading to the bridge, and the express crushed into the derelict wagons at great speed. The wagons were loaded with cement, and the impact was so tremendous that the locomotive and the first wagon were welded into an inextricable mass. The tender was forced over the buttresses of the bridge and pitched into the river below. The front three coaches overturned and fell down the side of the embankment some 20 ft., but the remainder of the train retained its upright position although derailed. A general view of the scene is reproduced on the opposite page. The front coach was very badly smashed through colliding with the stonework of the bridge, and it is stated that rescue work was delayed owing to the shortage of tools and the intense darkness.

The driver of the express stated that he did not see the wagons until he was quite close to them, and that, although he promptly applied the brakes, it was impossible to avert the collision. The guard of the goods train said he walked back along the track some three miles in order to warn the driver of the express, but neither the driver nor the fireman heard any alarm signal from the detonators laid down by the guard.

War Traffic on the Great Eastern Railway.

DURING the period of the war nearly 13,000 special trains for the conveyance of troops were run, carrying, between August, 1914, and March, 1919, inclusive, 6,231,293 officers and men, 233,477 horses, 40,372 vehicles (including guns), 42,466 cycles and 40,000 tons of baggage. Also dealt with were 1,172 ambulance trains, conveying 177,000 patients. Demobilisation involved about 100,000 journeys. In addition the company provided approximately 11,000 special trains, principally of an emergency character, for the conveyance of various Government traffics, a great deal of which was also carried by ordinary trains. Served by the Great Eastern Railway were 203 munition works, 16 Government factories, 9 Government depôts and 31 aeroplane depôts, while 45 factories and 16 shipbuilding yards were either opened or extended during the war period; apart from the changes and extensions applying to many existing establishments. These developments frequently changed essentially the volume and character of traffic. One establishment, for example, increased its traffic by 600 per cent.

The Great Eastern was specially concerned in precautionary measures to be taken in the event of any invasion or attempted invasion of the Eastern Counties. For this reason the Great Eastern had, in addition to such actual transport work as that already indicated, a vast amount of other work to do in connection with the war in regard to which there was little or nothing to show, since the emergencies provided for did not arise. Everything had to be got ready for movements of troops on the largest possible scale and with the utmost possible despatch to any point along the coast should the occasion therefor actually arise. This necessitated a large number of new works in order to provide both for immediate and for prospective troop movements; the planning of other works or measures to be carried out or adopted in case of need, and the constant compilation or revision of staff time-tables for special troop-train movements under a wide range of possible conditions and contingencies. So numerous, in fact, were the staff time-tables, instructions and other documents issued in connection with all these matters, and such was the urgency

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with which everything had to be done that for the first six weeks of the war the Great Eastern Railway printing works at Stratford Market were open night and day, while throughout the whole period of the war they were frequently open on Saturday afternoons and Sundays.

Special Features of Great Eastern War Traffic.

THE sum total of Great Eastern Railway expenditure on the production of munitions of war and the carrying out, through the Department of the Chief Mechanical Engineer, at Stratford, of other special work on Government account was over £1,250,000. This figure was nearly equal to the company's expenditure in two years, at pre-war rates, on the maintenance and renewal of locomotives, carriages and wagons. The work was carried out notwithstanding the fact that 1,500 men from the department, or, approximately, 25 per cent. of the normal staff, were serving with the Forces, and in spite, also, of the fact that, although maintenance was considerably in arrears, the rolling-stock was maintained sufficiently to meet the very heavy demands made upon it for the transport of passengers and goods.

Ten gun carriages and 16 limbers for 6-in. long-range guns, 440 road-transport wagons, 225 covered goods wagons having a capacity double that of the standard Great Eastern wagon; 2 workshop repair trains, each consisting of five vehicles, for Egypt; five ambulance trains for British troops on the Continent; two similar trains for use in Great Britain, two for the American Army; 950 built and 388 converted miners' trucks, 30 water-tank carts and 1,750 ambulance stretchers represent other war work carried out at the railway works; 43 goods locomotives, 20 20-ton locomotive coal wagons, one 20-ton steam breakdown crane, 20 suburban brake vans (altered and equipped to serve as brake vans for goods trains in France) and 30,000 sleepers (22,000 new and 8,000 second-hand) are typical of material sent overseas.

Great Eastern Railway Steamers.

ALL vessels employed in Continental traffic were commandeered by the Government with the exception of the *Brussels* the *Colchester* and the *Cromer* with which, together with other ships placed at their disposal, the company were able to maintain their service with Holland during the whole period of the war except on occasions when the North Sea was barred by order of the Admiralty. The number of trips made was 1,222. The mails were carried, large quantities of essential foodstuffs were brought from Holland, and about 14,000,000 parcels were conveyed there for British prisoners of war in Germany and Austria. Of the three turbine steamers taken over by the Admiralty, the *Archangel* was used as a transport between Channel ports and French ports until the signing of the armistice, when she was employed to bring repatriated British prisoners of war from Rotterdam and Antwerp to Hull, and, on the return journey, to take back repatriated German prisoners of war. The *St. Denis* was employed as a transport until September, 1915, then becoming a hospital ship—a designation subsequently changed to that of armed ambulance transport. The *Copenhagen*, which rendered various services for the Government, was torpedoed and sunk in the North Sea in March, 1917. The twin-screw steamers *Amsterdam* *Vienna* and *Louvain* were used as armed boarding vessels. The *Louvain* was torpedoed and sunk in the Mediterranean in January, 1918. The cargo-boats *Clacton* and *Newmarket* served as mine-sweepers, and both were lost through enemy action. Of the vessels which carried on the service to and from Holland, the *Brussels* was captured by the Germans in June, 1916, her gallant commander, Captain Fryatt, being afterwards tried by court-martial and shot because, on a previous occasion, he had saved his vessel from a German submarine. The *Colchester*, captured in September, 1916, was sunk while in enemy service.

Not only were most of the Great Eastern Railway steamers taken over by the Government, but the same was the case, also, with Parkeston Quay, which, by reason both of its geographical position and the excellence of its facilities and general equipment, and in combination with the port of Harwich, of which it forms an essential part, was of invaluable assistance to the Admiralty in facilitating the British Navy's control of the North Sea and in constituting what became the most important naval base between Dover and the Firth of Forth. The Great Eastern Company's engineering works at the port were, also, from the first day of the war, a valuable asset to the naval authorities for the repairing and refitting of various types of vessels stationed at Harwich.

A Good Word for the Westinghouse Brake.

ON March 30 a slight buffer-stop collision occurred at the Central Station, Glasgow, owing to a failure of the Westinghouse brake. The train was one bringing morning workers into the city, and the collision itself would have had no adverse results had it not been for the fact that a number of passengers were alighting or preparing to alight, and

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even then there were only seven cases of minor injury and no material damage was done. The driver had noted that the air-pump had ceased to act when approaching Cambuslang Station, and although he was in fault in not reporting the failure at that station, both he and his fireman appear to have acted with special care, though too much dependence was placed upon the reserve capacity of the brake reservoir. Indeed, the driver's action in reversing his engine appears to have caused the collision in that the locking of the wheels resulted in skidding, but for which a safe stop would probably have been made.

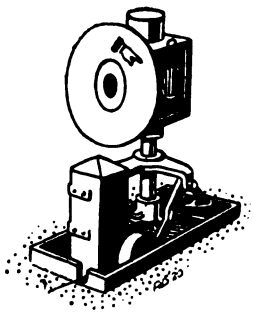
In his report to the Ministry of Transport Major Hall speaks in distinctly favourable terms of the general trustworthiness of the Westinghouse brake. He says :—

" The case is of interest as being one of the rare instances of an accident resulting even indirectly from a failure of some part of the brake apparatus on a through fitted train. The actual cause of the breakdown of the air pump was a broken piston valve. The situation immediately consequent upon such a failure is that there is a considerable amount of reserve power, available both for the application and the release of the continuous brake, stored in the auxiliary and main reservoirs on the coaching stock and engine respectively. Repeated applications and releases of the brake subsequent to a pump failure result in a gradual reduction in this reserve of power, the final stage being one in which the residual pressure is insufficient to apply the brakes with sufficient force to effect a reasonable degree of retardation. Whether or not there will be, before this stage is reached, a condition when the brakes cannot be released after their last application, appears to be uncertain and to depend to some extent upon the details of the valve gear and the actual condition of the moving parts. In this case there appears to have been no difficulty in releasing the brake prior to the last application made."

A pleasing feature of the report as a whole is that, except that the driver was in fault in not reporting the failure at Cambuslang, every one concerned seems to have acted reasonably and with due regard to the safety of train and passengers.

Railway Statistics, Year ending March, 1920.

A STATEMENT recently issued by the Ministry of Transport shows that during the 12 months ending March 31, 1920, the controlled Railways of the United Kingdom earned from passenger train traffic, £94,818,686; from goods train traffic, £89,485,894, and from Government traffic, £18,264,182, a total of £202,568,762. This has to be reduced by £11,007,656 to cover cost of collection and delivery, £5,956 added for mileage demurrage and wagon hire, and £1,840,901 added under miscellaneous headings. Total revenue is, therefore, brought to £193,407,963, against which must be set an expenditure of £185,819,213, leaving a balance of £7,588,750. This is reduced by £447,680 by the loss on " Other Businesses "—passenger road vehicles, steamboats, canals, docks, harbours and wharves, hotels, refreshment rooms and cars, &c.—to £7,141,070 to meet a total to be made up by the Government guarantee of £48,490,600. This includes £47,440,000 as the standard year proportion of net receipts; while £1,050,600 has to be added to cover interest on capital works brought into use, bringing the net Government liability to £41,349,530. This total does not represent the whole of the charge falling on the Exchequer, since no account is taken of the liabilities which may attach to the Government in respect of (*a*) replacement of stock of stores and materials; (*b*) abnormal wear and tear, and (*c*) arrears of maintenance other than permanent way and rolling-stock.



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A YEAR ago Mr. Ernest Wharton was made Mineral Traffic Manager of the London and North Western Railway. Now comes the news that he has been appointed an Assistant to the General Manager Mr. Wharton's railway experience covers a period of upwards of a quarter of a century, and embraces leading appointments at many of the principal centres on the London and North Western Railway. Prior to his appointment as Mineral Manager he was District Goods Manager for the Birmingham district, after having acted as District Goods Manager in the Warrington Division, during which latter period great difficulties had to be surmounted in connection with the big strikes in the railway world and in the coal and cotton industries.

* * *

A HANDSOME memorial to the men of the Great Northern Railway who gave their lives in the Great War has been unveiled at King's Cross Station by Field-Marshal Earl Haig. The memorial, designed by the Chief Engineer, is in the Ionic style, of black Swedish and Aberdeen grey granite with statuary marble panels containing the names of the fallen in lead letters. The wreaths and the lettering of the inscription, "To the Immortal Memory of the Men of the Great Northern Railway who lost their lives in the Great War," are in bronze, as also are the capitals and bases to the columns. In addition to the directors, the General Manager Mr. C. H. Dent, the Secretary, Mr. Eustace Burrows, the Superintendent of the Line, Mr. C. J. Selway and other chief officers were present. Before unveiling the memorial Earl Haig said that this was a fitting opportunity to say a few words of special thanks for all that the railways of Great Britain did for those who were fighting through the long war. In his despatches he had borne testimony to the splendid work of the railways, and he welcomed the opportunity of expressing his gratitude personally to them, and through them, to all the railwaymen of Great Britain and the Empire. This memorial stood for the splendid answer which railway men gave as a body when their countrymen called to them. Might it ever remind them of the debt they owed and of the example which these heroes set us.

MR. ERNEST WHARTON,

Appointed an Assistant to the General Manager, L. & N.W.R.

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AT a recent meeting of the London "Safety First" Council the Railway "Safety" Committee announced that it was revising and reprinting the posters addressed to railwaymen and railway travellers, and was about to issue an illustrated poster dealing with the dangers of attempting to board or alight from moving trains. The committee further stated that, with a view to interesting railway workers through their children, it had referred to a special sub-committee, for consideration and report, details of a suggested essay competition for children of railway employees, the details to include the preparation of a special poster and the

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presentation of prizes of the value of £20, in addition to a number of certificates.

* * *

AT the Willow Walk Goods Depôt of the London, Brighton and South Coast Railway, Mr. White, the Goods Agent, on behalf of Sir William Forbes, the General Manager, presented 14 Safety First Badges, 3 bars and 12 diplomas to 29 carmen in the employ of the London, Brighton and South Coast Railway, who during the past year had driven their vans in the London district without accident. These awards are distributed by the London Safety First Council.

* * *

MR. ROBERT S. BLUE, who was recently appointed Canal and Sack Superintendent,

MR. ROBERT S. BLUE,

Canal and Sack Superintendent, North British Railway.

North British Railway, joined the service as junior clerk in the district goods manager's office, Edinburgh. After a year's training there he went to the forwarding office at Waverley goods station, Edinburgh. In 1901, after passing through all branches of the goods department business at Waverley, Leith Walk, South Leith and Rose Lane stations, Mr. Blue was appointed cashier at Galashiels Station, where as Deputy-Stationmaster he gained considerable experience. In 1904 he was transferred from Galashiels to Edinburgh (Waverley) to take up the position of chief forwarding clerk in the same office where, as a boy, he had commenced his station training, and in 1907 he became chief clerk in the District Traffic Superintendent's Office, Carlisle. His appointment as Canal and Sack Superintendent involves his return to Edinburgh.

* * *

THE Institution of Railway Signal Engineers now includes 7 foundation members, 10 honorary members, 156 members, 588 associate members and 3 student members. According to the report for the year 1919, five general meetings were held, two of which were occupied by a discussion on Mr. Thorrowgood's paper on "The Renovation of Leclanché Porous Pots and the Reuse of Spent Dry Cells." An interim report from the sub-committee on track-circuit nomenclature was placed before the members. The Council record with regret the deaths during the year of Mr. J. P. O'Donnell; Mr. J. R. Insell, Great Indian Peninsula Railway, India; and Mr. W. G. Crocksatt, Signal Engineer, Central Argentine Railway.

* * *

MR. H. WEBSTER, M.I.Loco.E., of the Great Eastern Railway, recently read a paper on "The Behaviour of Steam in the Cylinders of a Locomotive," before the members of the Institution of Locomotive Inspectors and Foremen, in the Ambulance Room at Victoria Station, South Eastern and Chatham Railway.

* * *

MEMBERS of the Institution of Locomotive Engineers visited the plant of the South Metropolitan Gas Company at East Greenwich on Saturday, May 29, on the invitation of Dr. H. Carpenter, C.B.E., and the directors. The party was conducted round the premises by Messrs. MacDonald, Barnett, Kerr and Thomas, special attention being given to the extensive railway system on which 24 standard gauge and 3 narrow gauge locomotives work, and the coal and coke shipping appliances on the riverside.

* * *

IN response to an application from the Lindsey County Council, Colonel R. Howell Davies, D.S.O., one of the engineering inspectors attached to the Roads Department of the Ministry of Transport, was sent to Louth to assist and advise in connection with the damage done to roads and bridges by the recent flood.

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THE train hustler system which was put into operation some months ago at several stations on the Underground Railway, for instance, at Victoria and Charing Cross, is being adopted to the operation of lifts, with the object of regularising and improving the

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lift service at the less busy stations. When the lift has remained at the landing a predetermined number of seconds, which will vary according to the volume of traffic, a syren blown by compressed air is sounded. When the syren blows the liftman operates the lift. The object of the apparatus is to give audible warning to the lift operators and to passengers that the lift must leave at once, and the equipment is so arranged that if the lift is late in leaving one of the landings its pause at the next is correspondingly curtailed. The apparatus is now working at Down Street Station, which is a "light" station and requires only two lifts for the "rush hour" traffic, and the operation of the syren is such as to give a minute's service of lifts during the "rush hours" of the day and a two minutes' service during slack hours. The following sign appears at the top and bottom landing: "Lift Leaves when Syren Blows." The popularity of the experimental lift-syren at Down Street Station is thoroughly established, both with the public and the operating staff. It is not, perhaps, as melodious as Big Ben (though friendly critics have commended its "fine contralto tone"); but it is just as regular. It has been mis-named a "hustler": its great advantage is that it removes all anxiety, and it should be called a "soother." Every 65 seconds it announces that a lift is starting up or down. The passenger knows exactly how he stands. There is no more worry over missing trains or waiting for, or in, the lift. All concerned know that the syren sounds at fixed brief intervals, and that, as soon as the syren sounds the lift in which they are for the moment interested must start.

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THE Minister of Transport has recently confirmed the under-mentioned orders made by the Light Railway Commissioners under the Light Railways Act, 1896 and 1912:—Sand Hutton Light Railway Order, 1920, authorising the construction of Light Railways from Worthill Station in the North Riding of the County of York to Scrayingham in the East Riding of the said county; Peterborough and District Light Railways (Amendment) Order, 1920, authorising an increase in certain rates, charges and fares specified in the Peterborough and District Light Railways Order, 1900; Middleton Light Railways (Amendment) Order, 1920, authorising an increase in certain rates, charges and fares specified in the Middleton Light Railways Order, 1898.

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A FEW London and South Western Railway suburban steam trains usually used for race and special traffic are already painted the same dark green as the electric trains, and it is the intention to use the same colour for the main-line stock as re-painting becomes necessary.

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AT a recent conference between the heads of the various Departments of the Ministry of Transport and Mr. E. W. Chalmers Kearney it was arranged that a section of the Kearney high-speed railway be constructed as a demonstration. This is to be built on the surface but will have all the essential features proposed by Mr. Kearney for future tube railways, *i.e.*, the line will run from one hill top to another with up and down gradients of 1 in 7, with a total vertical drop of about 120 ft. Sixty miles an hour is to be attained along the lower level, which would correspond with that portion beneath the Thames in the proposed high-speed tube between North and South Woolwich. So that the test may be complete the track is to be built on a curve of one mile radius. The site selected is between Brighton and Rottingdean, where the natural formation of the ground provides the necessary conditions, and at their last meeting the Brighton Corporation decided to support the proposal and to loan the land on the East Sussex Estate to the Kearney High-Speed Railway Company, Limited, for the purposes of the test line. The car which will be used has already been built. This seats 44 persons and is electrically driven through each of the four under-wheels. As RAILWAY MAGAZINE readers are aware the Kearney system employs only one ground rail, the cars being secured by means of an overhead guide rail supported on standards placed at intervals of 60 ft. The forthcoming demonstration will be awaited with great interest in view of the possibilities of the Kearney high-speed railway as applied to future tubes.

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THE Ministry of Transport makes the following statement on dock congestion:—During the first quarter of the present year the traffic dealt with by rail at Bristol, Hull, Liverpool and the principal docks in London was in all cases considerably in excess of the traffic dealt with during the corresponding period of 1913. From the latest available returns only two ships are waiting for berths in the principal ports of Great Britain; these are at Glasgow. Reports show that as regards the supply of wagons and sheets, the position in London has been greatly improved. Satisfactory reports in this respect have also been received from Liverpool, Manchester, Cardiff, Grimsby, Glasgow, Leith and Dundee. There is a tem-

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porary shortage of wagons at Bristol and Hull, and everything possible is being done to alleviate it. With these exceptions there is no evidence that any congestion at ports is due to shortage of railway wagons or to shortage of transport facilities of any description. All the evidence in the possession of the Ministry of Transport goes to show that any congestion at the present time is caused by gluts of imports of various commodities in excess of the current market requirements. In the case of the coal-shipping ports congestion of shipping is due to lack of coal for export. There is a marked improvement in the number of wagons available for traffic, and the appeal to traders, coupled with increased demurrage charges, has resulted in a considerable decrease in the detention of wagons, the returns for April showing that demurrage charges were incurred in respect of 233,293 wagon-days detention as compared with 365,533 wagon-days in December, an improvement of 36 per cent.

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In response to a request from locomotive mutual improvement societies at several centres on the Great Central Railway, the Westinghouse Brake Company, Limited, York Road, King's Cross, recently gave a demonstration of the plant there installed and a first-hand explanation of the brake, which, although it is so widely used all over the world, is relatively strange to men whose experience has been associated mainly, if not exclusively, with vacuum apparatus. This request may be attributed partly to the fact that many Great Central Railway locomotive men are now working War Department R.O.D. 2–8–0 engines, whereon Westinghouse equipment is provided; but it is indicative of a praiseworthy desire to become familiar with practical locomotive working, including features which may not be directly involved in their daily work. The demonstration plant at the Westinghouse works provides an equivalent to the braking of a 30-vehicle train, with train pipe lengths and connections as for a 1,000-ft train. Mr. J. J. Elmer, retired, for many years works manager, gave an instructive lecture, and Mr. O. J. F. Thorpe expressed the pleasure it gave the Westinghouse Brake Company to receive the railwaymen and to do what they could to assist practical knowledge on the part of enginemen of the mechanism with which they were concerned.

* * *

Among other activities, the Railway Club has arranged three outings during July. On the second Saturday in the month the members will journey to the "mystery" port at Richborough; on the third Saturday the London, Brighton and South Coast Railway locomotive sheds at Battersea will be visited, and on the fourth Saturday the Kentish Town locomotive sheds of the Midland Railway will be inspected. Now that the headquarters of the Club are located at Leplay House, 65, Belgrave Road, London, S.W. 1, not only the London, but also the country members, are possessed of a rendezvous of which full advantage is being taken.

* * *

Our Crewe correspondent, Mr. C. Williams, writes:—

"A new series of four-cylinder passenger engines ("Claughton" class) will shortly be in service on the London and North-Western Railway. These engines, which are provided with two safety valves of the Pop pattern, will be turned out in the following order, viz.:—Nos. 1914, 69, 178, 194, 972, 1177, 2179, 2499, 2511, and 1599. Of these, No. 1914 is provided with a name plate of unusual size, on which appears the name *Patriot*, and, below this, in smaller letters, the following: 'In Memory of the fallen L. and N.W.R. Employees, 1914–1918.'

"The six 2–8–0 mineral engines (R.O.D.-type) recently taken over from the Lancashire and Yorkshire Railway are now numbered 2950–2955 in the London and North-Western Company's list. On the R.O.D. they were numbered 1803, 1843, 1857, 1900, 1922, and 1984 respectively. There are now no fewer than 156 of these engines in service, Nos. 2800–2955 inclusive.

"The following four-cylinder compound passenger engines are being converted into two-cylinder simple 'Renown' class:—Nos. 1920, 1932, 1934, 1963, and 1968.

"Nos. 305 and 2578 ('Precursor' class) are being rebuilt with extended smoke-boxes, and superheated.

"The boilers for the 'Claughton' class mentioned have been supplied by Vickers, of Barrow, and I understand that they will supply those for the other 60 engines to be built. Apparently the proposal *re* No. 1918 *Victory* being put on the second of the new series has fallen through, although I notice publication of same has not been entirely withheld. Boilers for converted engines are coming in from the North British Locomotive Company, as well as from Nasmyth, Wilson & Co., thus leaving the Company's own shops free to carry out repairs, and replace those that are worn out.

"As to those engines not yet returned from overseas, I understand that the ques-

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tion of replacement is under consideration, and that a decision is expected to be arrived at shortly.'

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MESSRS. BASSETT-LOWKE, LIMITED, of London and Northampton, have now almost regained their pre-war capacity for the production of their well-known model railways and railway equipment. A selection is not as comprehensive as in 1914, but several important new lines are in course of preparation for the coming season. They have also re-installed a special department for the manufacture of glass case scale model locomotives for railway companies and other publicity purposes, and have descriptions of these in hand at the present time. RAILWAY MAGAZINE readers resident in or visiting London, who are interested in model work, should make a call at the London retail branch and show-rooms.

* * *

MR. E. E. ROBINSON, JUN., writes:—Regarding your correspondent, Mr. Wm. T. Hoecker's query respecting the Webb 3-cylinder compound No. 1306 "Ionic's" run on September 8, 1895, when the engine made a non-stop run from Euston to Carlisle (299½ miles) in 353 minutes, the following paragraph appeared in the *Birmingham Daily Mail* of September 9, 1895:—"Yesterday the London and North Western Company demonstrated the capability of running a heavy train from Euston to Carlisle, a distance of 300 miles, without a stop. A special train of seven coaches left Euston at 8.45, passed Crewe, 157 miles, at 11.50, and drew into Carlisle (over 300 miles) at 2.38, performing the longest journey without a stop ever attempted in this country. The engine was the *Ionic*, the driver Ben Robinson. A party of railway officials travelled by the train and declared the experiment to have been thoroughly satisfactory." At the completion of the run, according to an authority, all the working parts were found to be perfectly cool

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A Gloucester RAILWAY MAGAZINE reader writes to say that the 2-8-0 R.O.D. locomotives serving on the Great Western Railway are all receiving Swindon numbers, commencing at 3000, and running consecutively. These being the numbers formerly carried by the 7 ft. 8 in. singles.

* * *

RAILWAY MAGAZINE readers interested in model locomotives will be pleased to know that W. H. Jubb, Limited, Brittain Street, Sheffield, are about to put on the market models, in two different gauges, of the Great Northern Railway new 2-6-0 locomotive No. 1000, the same engine that forms the colour frontispiece to this issue. Readers desiring further particulars should take up with the firm direct.

* * *

A GRAVEYARD Memorial which has been erected by the Great Eastern Railway in memory of the late Captain Fryatt was formally unveiled by the Rt. Hon. Lord Claud Hamilton, P.C., in Old Dovercourt Churchyard on Friday, June 18.

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A FURTHER edition of "Metro-Land," a handy handbook that may well be described as the Pleasure Seekers' Compendium, is now obtainable at any Metropolitan Railway Station, price 2d. This publication, which strikes a new departure in railway publicity, deals with the manifold attractions of the home counties of Middlesex, Herts and Bucks, and contains in addition to many full-page coloured plates, maps, &c., a store of literary, historical and biographical information. The Commercial Manager, Metropolitan Railway, Baker Street Station, N.W.1, will be pleased at all times to furnish fullest information relating to any particular district served by the railway, and, further, cordially invites enquiries on any subject affecting the company's system.

* * *

A DISTINCTLY novel attraction was recently provided in the Canadian Pacific Railway office windows at Charing Cross, viz., an excellent model aerodrome of the Aircraft Transport and Travel, Limited, at Hendon, together with scientifically accurate models of various types of aeroplanes and airships. Such a display in a railway and shipping office is a sign of the times, also marking much enterprise on the part of the Dominion Express Company of Canada. Realising the importance of maintaining a really "express" service, if its name is still to be justified, the Dominion Express Company made arrangements to act as passenger and parcels agents for the Aircraft Transport and Travel, Limited, on their London—Paris daily air service. It is thus possible for either passengers or parcels to be booked for conveyance by aeroplane to or from London and Paris through any of the Dominion Express Company's offices in Europe, and these, in addition to London, are to be found in important cities such as Liverpool, Glasgow, Manchester, Birmingham, Bristol and Paris. The Dominion Express, holding, as it does, the exclusive right of shipping express parcels over the entire Canadian Pacific Railway system, as agents for the aeroplane service can ensure that an express package

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scheduled to go on a certain ship actually reaches its destination in Canada in the shortest possible space of time. The time-table shows that only 2¼ hours is occupied on the journey to or from London and Paris —urgent letters are carried at 2s. 6d. per ounce over the ordinary letter rates. Parcels for delivery in Paris on the same day have to be handed in at 62–65, Charing Cross, London, S.W.1, before 10.30 a.m. The parcels rates range from 1s. 6d. to 2s. 6d. per pound, according to quantity, while special rates are quoted for large and regular consignments. The single fare for passengers is 15 guineas, which includes a car to convey the passenger to Hounslow, the starting point.

* * *

ILLUSTRATED literature descriptive of the scenery of unsurpassed grandeur to be met with on a holiday spent in Canada, together with particulars of fares, hotel tariffs and accommodation, sports and pastimes, &c., may be obtained post free from the Canadian Pacific Railway, 62-65, Charing Cross, London, S.W. 1

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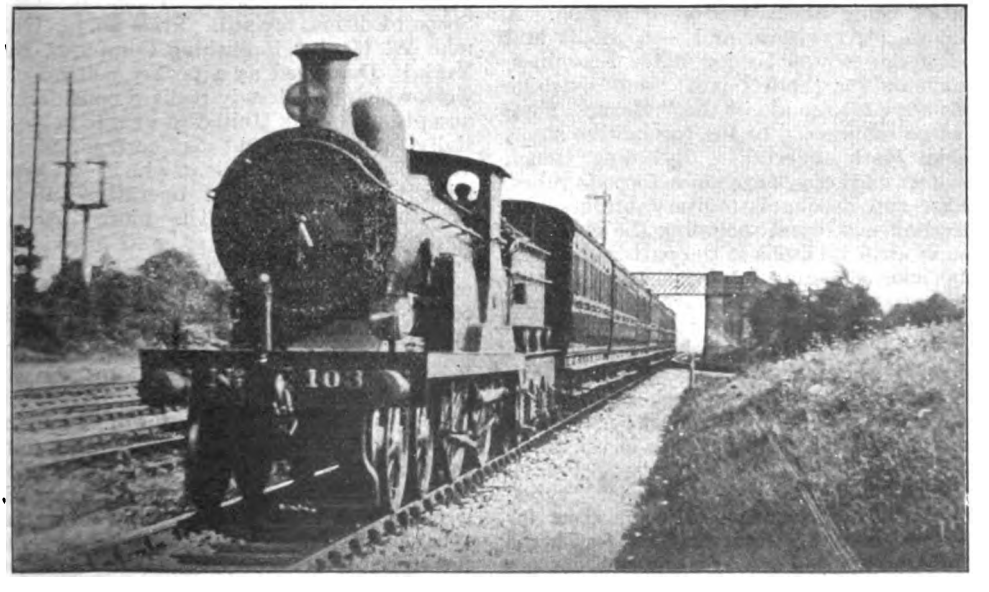
RAILWAY MAGAZINE readers who contemplate a vacation in Scotland can obtain a list of furnished lodgings available for visitors in districts served by the Great North of Scotland Railway, by writing to Mr. George Davidson, General Manager, Aberdeen. The booklet contains particulars of the health resorts on the system and contains an excellent map.

* * *

DISPLAY of the first examples of a new series of "Underground" pictorial posters is a welcome reminder that we are gradually getting back to the customs and conditions of peace. By its advertisements the "Underground" seeks to brighten with life and colour the drab surroundings of our journeyings about London, and to add some pleasure or amusement to the daily round, and with this policy is combined a sincere endeavour to play a part in raising the general tone of pictorial advertising. The war suspended almost all the "Underground's" activities in this direction, and much public interest has been aroused by the revival of the popular "picture" advertisements. The new series includes the first pair of 12 drawings of "London Characters," by E. A. Cox, R.B.A., entitled "Billingsgate" and "Petticoat Lane," and three finely coloured pictures of Windsor, Kew and Barnes by Gregory Brown, R.B.A., E. L. Tafani and Minnie McLeish, respectively. Two Haselden cartoons in black and white treat the temporary traffic difficulties of the time with the merry touch that characterises this artist. These illustrate, respectively, the "Underground" adventures of the hare and the tortoise, and the game of "Catching the Bus." And there are more to follow.



SOUTH EASTERN AND CHATHAM RAILWAY.
Hastings-Charing Cross Express near Orpington. 4-4-0 locomotive, No. 103.

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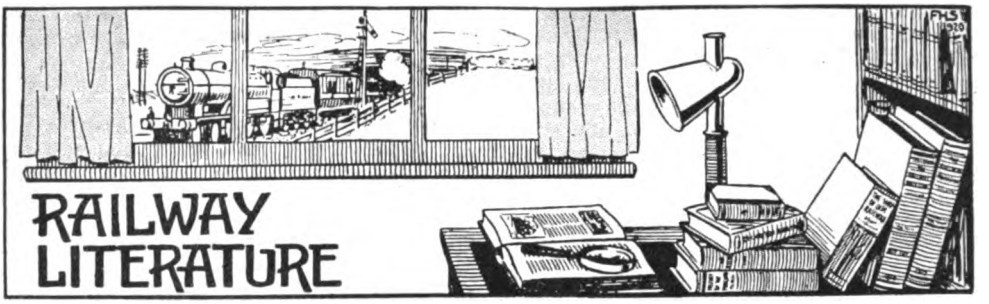

NORTH BRITISH LOCOMOTIVE COMPANY, LIMITED: MANUFACTURE OF LOCOMOTIVES AND MUNITIONS OF WAR, 1914–19. A handsome brochure issued by this well-known firm has been issued to record special services rendered during the war period. Included is a short history of the three firms incorporated in the present company in 1903. Portraits of the chairman, Sir William Lorimer, LL.D., Mr. Hugh Reid, C.B.E., LL.D., deputy-chairman and chief managing director, together with a group showing other directors, are reproduced, and the volume as a whole contains many illustrations of interest and value.

With premises both extensive and thoroughly up-to-date, it followed of necessity that the North British Locomotive Company should be quickly brought into the field of special war work. Two new buildings in course of erection were very soon turned into account, one, known as the "Mons" shell factory, being from the start "manned" entirely by women, the other, the "Marne" factory, being devoted to shell forging. A total of 497,125 6-in. and 8-in. shells and shell forgings was turned out. Sea-mines, casements for "pill boxes" and machine guns were also made in the "Marne" shop in large numbers. In the locomotive shops special work undertaken, including trench howitzer carriages, aeroplanes, torpedo tubes, tanks, gun carriages, military bridges and miscellaneous items, including the construction of artificial limbs in the pattern-makers' shop, caused many departments to present appearances very different from those associated with their proper activities. All the time, however, the construction of locomotive engines was actively proceeding, and among the types turned out may be mentioned the following:—French State and Paris-Orleans Railway, 380 of the 4-6-2, 4-6-0, 2-8-0 and 2-8-2 types; French Military Railways, 0-4-4-0 "Pechot" type; 300 War Department 2-8-0 locomotives for overseas service; 152 engines for home railways, regarded as war work, and engines for India, Africa, South America, &c., in completion of pre-war contracts and as justified by the requirements of the war period in considerable numbers. Altogether 1,412 locomotives were delivered during the war period, of which 695 were definitely allocated to the war areas. The total invoice value of the output during the war period was approximately £16,000,000. On the outbreak of the war the total staff was 8,347; On November 11, 1918, it was 5,738 men and 1,781 women. A total of 3,120 men went on active service, and of these 367 were killed. War Relief Funds reached a subscription total of £28,354, of which £27,158 has been allocated. At an early period in the war, part of the fine administration building in Flemington Street, Glasgow, was handed over to the Scottish branch of the British Red Cross, and as the Springburn Hospital received 8,211 wounded soldiers between December 24, 1914 and May 21, 1918.

WESTINGHOUSE E-T AIR-BRAKE INSTRUCTION POCKET-BOOK. By W. W. Wood. Second Edition, revised. Price $2.50. [Norman W. Henley Publishing Company, New York.] Described as a pocket edition of a work which has already realised considerable acceptance in the United States, it is essentially practical, and is correspondingly valuable to the railwayman who is concerned with the working and operation of the Westinghouse brake. The more intricate forms of the air-brake as used abroad are covered, as well as the standard patterns, while description is assisted by a number of coloured diagrams which materially assist appreciation of the explanations given.

ENGINEERS' DESK-BOOK AND DIARY. Trades Publicity Company, 38, Park Row, Leeds. Of convenient size for desk use and including useful tabular matter and data, this diary should appeal to business men concerned with engineering. Statistical material is more of a trade and reference character, though of engineering application and, therefore, differs from that usually given in diaries intended for technical users.

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THE RAILWAY MAGAZINE.

2-6-0 SUPERHEATER LOCOMOTIVE, No. 339.
LONDON, BRIGHTON & SOUTH COAST RAILWAY.

Designed by Lt.-Col. L. B. BILLINTON, C.B.E., Locomotive Engineer.

Fitted with Robinson Superheater, Top-feed dome, Weir Feed-pump, Feed-water Heater, and Wakefield Mechanical Lubricator.
Cylinders, 21 in. by 26 in. Coupled Wheels, 5 ft. 6 in. diam. Leading Wheels, 3 ft. 6 in. diam.
Heating Surface: Tubes, 1,156 sq. ft.; Firebox, 139 sq. ft.; Superheater: 279 sq. ft.; Total: 1,574 sq. ft.
Steam Pressure, 170 lbs. per sq. in.; Grate Area, 24·8 sq. ft.
Weight in working order: Engine, 63½ tons; Tender, 41½ tons; Total, 105 tons.

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LANCASHIRE & YORKSHIRE RAILWAY
REGULATION OF HOLIDAY TRAFFIC
SEASON 1920
TO ENSURE THE COMFORT OF PASSENGERS TRAVELLING TO THE
BLACKPOOL AND SOUTHPORT DISTRICTS,
ARRANGEMENTS HAVE BEEN MADE TO AGAIN REGULATE THE TRAFFIC
EASTER :— THURSDAY, APRIL 1ST
WHITSUNTIDE :— FRIDAY, MAY 21ST TO SATURDAY, MAY 29TH INCLUSIVE.
SUMMER SEASON :— SATURDAYS, JUNE 26TH TO SEPTEMBER 25TH INCLUSIVE.
FRIDAYS, JULY 30TH TO SEPTEMBER 3RD INCLUSIVE. MONDAY, AUGUST 2ND, BANK HOLIDAY
ARTHUR WATSON.

POSTER ANNOUNCING REGULATION ARRANGEMENTS FOR THE 1920 SEASON.

The Advance Booking of Travel.

A Review of the Lancashire & Yorkshire Railway Company's scheme of passenger traffic regulation which ensures travel-comfort for passengers and enables the railway company to carry the traffic efficiently and economically.

By CHARLES TRAVIS, M.Inst.T.

THE activities of the Lancashire and Yorkshire Railway in and around Blackpool have previously been the subject of articles in the *Railway Magazine*. A general description of "Blackpool and its Railways," written by Mr. J. T. Lawrence, M.A., appeared in August, 1910, and an article by Mr. W. T. Perkins, entitled "The Biggest Holiday Traffic in the World" was published in the December, 1913, issue.

The fact that Blackpool indisputably has one of the biggest holiday traffics in this country—and possibly in the world—gives special interest to this review of the working of the passenger traffic regulation scheme now in operation on the Lancashire and Yorkshire line in connection with the holiday traffic to Blackpool and Southport. This scheme, which is the first of its kind to be applied on British railways, is considered to represent the most scientific method yet evolved for dealing effectively with a large-scale seasonal passenger traffic. In this article we are only concerned with the traffic to and from Blackpool, in connection with which, by the courtesy of Mr. Arthur Watson, C.B.E., General Manager of the Lancashire and Yorkshire Railway, we were granted facilities for investigation during the recent Whitsuntide holidays.

Travellers are "Regulated," not "Rationed."

The regulation scheme is a very ambitious one, although it is framed on quite simple lines. Its main feature may be described in a single sentence as "the advance booking of travel," for the whole scheme hinges on the receipt of reliable information as to the prospective flow of traffic on regulated days.

The scheme was first initiated at the time when the increasing war demands on the railway companies, both for personnel and material, forced the companies seriously to consider the desirability of establishing a system of travel registration, with the idea of ensuring that there should be no joy-riding on the railway, and that only those who could furnish reasonable proof of the necessity should be permitted to travel. This system was deemed impracticable and a subsequent suggestion of "rationing" passengers was turned down for a similar reason. As, however, the scheme of passenger traffic regulation scheme was introduced at that time as an experiment by Mr. Arthur Watson, C.B.E., General Manager of the Lancashire and Yorkshire Railway Company, the popular press, in commenting upon the scheme, coined the phrase "rationing of travel"—and this

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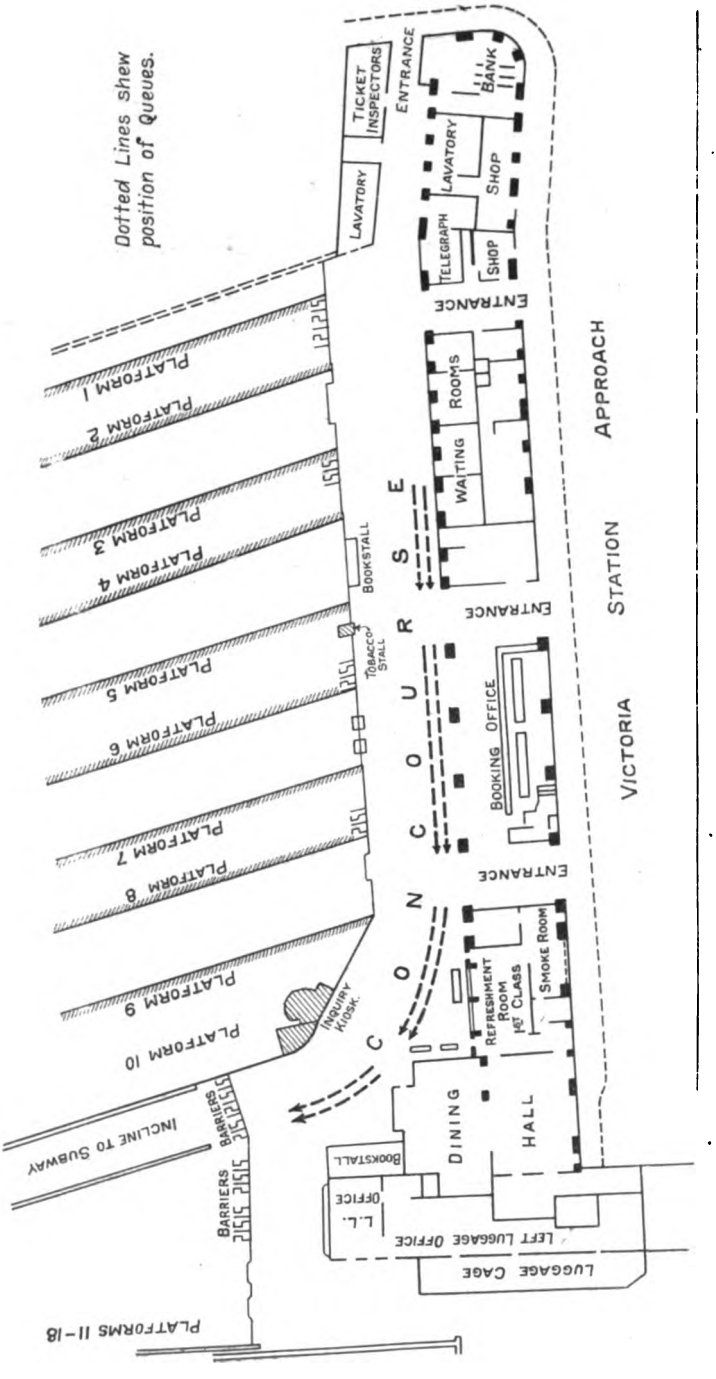

CIRCULATING AREA AND STATION BUILDINGS AT VICTORIA STATION, MANCHESTER.

Showing how queues of Blackpool passengers are arranged to leave circulating area free for use of other passengers.

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phrase has stuck. It should, therefore, be made quite clear that there is no "rationing of travel." Traffic regulation does not preclude any prospective passenger from travelling. It simply regulates his journey in accordance with the facilities available, and in return for his co-operation ensures reserved accommodation and, consequently, comfortable travel. From the railway point of view it permits the flow of traffic to be spread out smoothly over the stock finally allocated for service, and thus secures a good average train-load, which means economy.

As at first introduced, the scheme covered the regulation of traffic to the coast, but left the return journey to be made under the old "free conditions." This was speedily found to be a difficulty, as the delay and inconvenience suffered by passengers travelling from Blackpool contrasted unfavourably with the celerity and comfort with which they were transported from their home stations to the seaside. Accordingly, in 1919, when nearly one million passengers (apart from season ticket holders) were carried to Blackpool from Manchester and various other places in the period of 11 weeks comprising the summer season, the regulation scheme was applied to both outward and return journeys. It should be added that the regulation arrangements do not apply every day, but merely to the days of heavy travel, viz., Saturdays, with the addition of Fridays in August, on the outward journey, and Saturdays and Mondays on the return journey, with suitable amplifications at Easter, Whitsuntide and Bank Holiday.

THE OUTWARD JOURNEY.

The first principle of the regulation scheme is that of classifying traffic in such a manner that the accommodation of trains is utilised to full capacity without any crowding, and that, as far as possible, "point to point" block loads are arranged.

In order to make effective provision for the prospective traffic stream, it is essential that those desiring to travel shall book in advance. Consequently the booking offices are opened several days in advance of any particular regulated day for the purpose of issuing tickets for specific trains running on the regulated day. In order to render the scheme fully comprehensive, it was found that through bookings would have to be abolished and, by arrangements with the other companies, passengers travelling to Blackpool on regulated days are now booked no further than the junction stations where they have to re-book to Blackpool. For their convenience a certain percentage of tickets is allocated to meet these and any exceptional requirements.

On booking, each passenger is asked by which train it is desired to travel, and the ticket issued indicates the number of this scheduled train, this being shown in big block letters on the outward half of the rail ticket. The acceptance by the passenger of this ticket is proof that the railway company will reserve for him accommodation on the train for which the ticket has been issued and there is consequently no necessity for passengers to get to the station very much in advance of the train time in order to secure seats. An excellent display of posters also serves to assist passengers, and these posters show very clearly the actual timings in accordance with the number of the scheduled train which is shown on the rail ticket.

Returns are rendered by the stations to a Traffic Regulation (T.R.) department of the superintendent's office, the information there being collated and used as the basis for alterations in the train workings in advance of the day of travel. These returns also render it possible for adjustments in ticket allocations to be made with facility, and thus enable the full allocation of tickets to be taken up as far as possible. The control of the working of the regulation scheme is an essential and important part of the arrangement, and the T.R. department is vested with responsibility for all adjustments. It is there also that passengers, who find they cannot avail themselves of the tickets, attend for a refund of the fares. Such refunds are promptly paid, the only deduction made being one shilling for each ticket issued to compensate for the clerical work involved.

Control over the issue of tickets is arranged by dividing the stations into two classes, viz., "Allotment" and "Zone" stations. The allotment stations are authorised to issue a certain number of tickets for each regulated train, while the zone stations have to make application for their requirements to the Traffic Regu-

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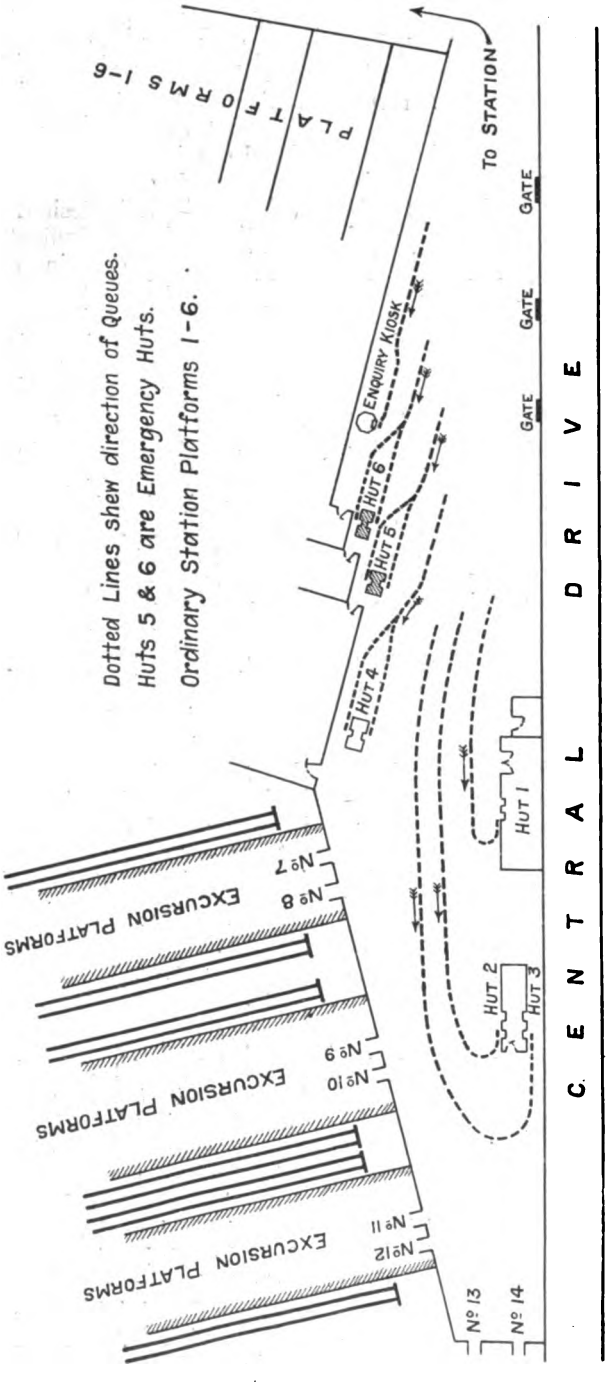

EXTENSION CONCOURSE, BLACKPOOL CENTRAL.

Showing location of special booking huts and method of controlling queues.

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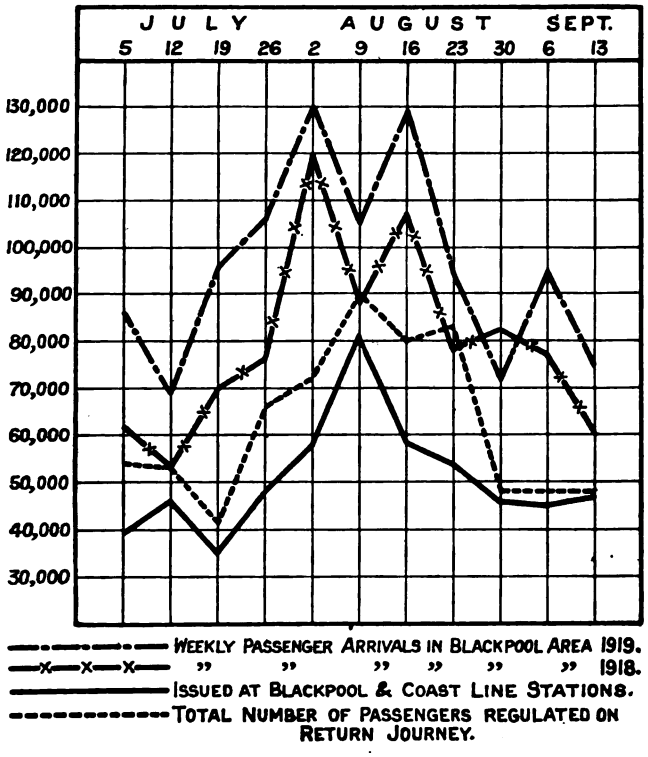
lation (T.R.) Department of the superintendent's office, which retains a number of tickets for this purpose. The name "zone" station was originally applied because, in the early days of the scheme, such a station made application to a favourably located allotment station for tickets. In practice this system did not prove to be sufficiently comprehensive, and it was decided to centralise the issue of such tickets in the T.R. department. This provides a complete check on all tickets issued.



Showing the number of Passengers arriving weekly in Blackpool during the 1919 season as compared with 1918, the number of Special Tickets issued at Blackpool, &c., during the 1919 season, and the total number of Passengers regulated weekly during the period from July 5 to September 13, 1919.

The tickets are divided between various allotment stations and the T.R. department, which supplies the requirements of the zone stations. The allotment stations naturally change in accordance with the flow of traffic, and on those regulated days for which they do not receive a definite allocation of tickets they become zone stations for the time being, and act in accordance with the instructions issued to that class. It may be remarked that while Manchester (Victoria), Bolton, Ashton, Stalybridge, &c., are designated allotment stations in connection with Manchester-Blackpool trains, it would obviously be of little utility to give them an allocation for trains running from Yorkshire stations to Blackpool, and in this case, such places as Barnsley, Bradford, Halifax, Leeds and Wakefield supersede them as allotment stations.

Before each seasonal period each allotment station is supplied with a list showing the maximum number of tickets that may be issued by that station for each train scheduled to run on the regulated days. To meet emergency requirements it is, however, laid down that approximately 5 per cent. of the tickets must be kept for issue on the day of travel, while in the event of the allocation for all trains being booked up prior to the day of travel the allotment station has to wire the T.R. department, stating the further accommodation required and by what trains. This arrangement is essential, for it may happen that certain allotment stations are not booking up well, and in that case the T.R. department, being fully acquainted with the general trend of the bookings from daily returns, can adjust the allocations in order to utilise the full number of tickets. If, moreover, all the allotment stations are booking well, and still further accommodation is wanted, arrangements can be made for the conditional trains (which, while timed in the working book, are not advertised), to be scheduled for service.

Four special forms are utilised by stations and town agents in connection with the allocation and issue of rail tickets. Form "A" is used by the zone stations to record applications for tickets; form "B" is a summary of the infor-

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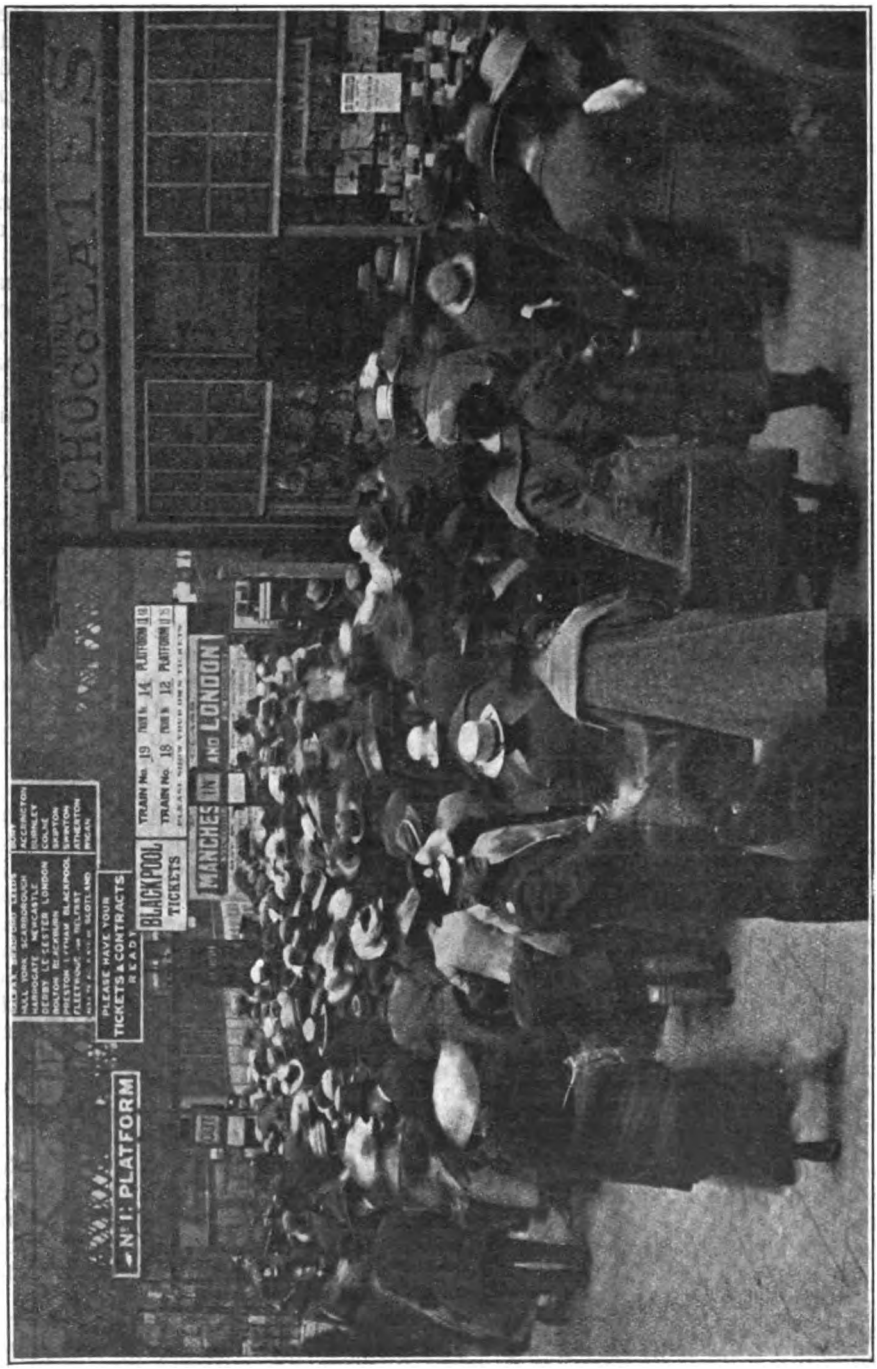

VICTORIA STATION, MANCHESTER.

Passengers for Nos. 18 and 19 Scheduled Trains to Blackpool passing through barriers towards departure platforms, Nos. 12 and 14. Six barriers are opened to permit of rapid handling of passengers.

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mation on form "A," and is submitted for authority to issue the tickets required. Form "C" is utilised exclusively by the allotment stations and shows the number of tickets issued by each regulated train, while form "CZ" is a general statement of bookings. A special form is kept in the T.R. department for each regulated train, this containing an exact record of the ticket issues day by day and covers both allotment and zone stations. By the use of the forms described the traffic regulation section is able to keep in close touch with the general position and so to adjust allocations that the trains are booked up to their maximum capacity. While keen attention has necessarily to be paid to the general question of ticket allocations and issues, it is found in practice that there is no particular difficulty in effecting any necessary adjustments.

ARRANGEMENTS FOR RETURN JOURNEY.

In order that adequate arrangements may be made for the economic transportation of passengers returning to their homes, it is essential to have a measure of control over the number of passengers likely to present themselves for each of the return trains. Arrangements are, therefore, made for each passenger to obtain a special ticket on application at the Blackpool Central Station, booking huts being provided to supply special tickets several days in advance of the day of travel.

The special tickets, each of which bears a number indicating the train on which it is available, are issued on presentation of the return ticket which is snipped to indicate that a special ticket has been issued. To simplify the work at the booking huts and to mitigate any inconvenience to passengers, an inquiry office is provided. Therein an experienced official is prepared to give information as to train services, &c., and as will readily be surmised he has to answer many and varied queries. The chief advantage of the special booking system in operation at Blackpool is that traffic is spread out more evenly throughout the day. If passengers find that No. 23 scheduled train, for example, has been fully booked up, they will take No. 24 or No. 22, and the result is, that all trains running to the various localities are well loaded, although not crowded.

The advance knowledge that trains are booked up to their full accommodation is of considerable utility in enabling the operating officials to put into service other trains, as required. In practice, however, the booking up of trains in this manner does not require new trains, for passengers will gradually spread out over other trains and so enable the company to obtain a good average loading on all the trains scheduled to run. Three trains for May 25 were actually booked up two days in advance of travel, while 11 more trains, making 14 in all, were booked up by 4 p.m. on the day prior to the day of travel.

The adjustment of the special ticket allocations has to be watched carefully in order that the full allocation, usually spread over the various stations in the Blackpool area, may be taken up. To this end each coast line station sends a return to Blackpool daily showing the progress of their ticket issues, and in case their allocation is fully taken up and further accommodation is wanted the stations telephone to the regulating office at Blackpool. From this information it is possible to adjust the allocations, the net result being that very little spare accommodation is run. On receipt of information as to the bookings at each point the regulating official at Blackpool is able to increase or reduce the allocations to meet the needs. This elasticity is extremely desirable as, otherwise, there would frequently be more passengers offering at one point than were covered by the allocation, while other points would be short of their allocation.

It may be added that in those cases where circumstances prevent the passenger, after booking his special ticket, from travelling on the specified train, he may have this adjusted on application at the regulating office at Blackpool. The official there, after satisfying himself that the application is not a frivolous one, issues a blank special ticket on which he stamps the number of the train upon which the passenger desires to travel, the rejected special ticket being replaced in the appropriate hut for circulation. The average number of adjustments weekly is about 400, 100 of these being effected at Talbot Road, where the chief booking clerk has discretionary power in this regard.

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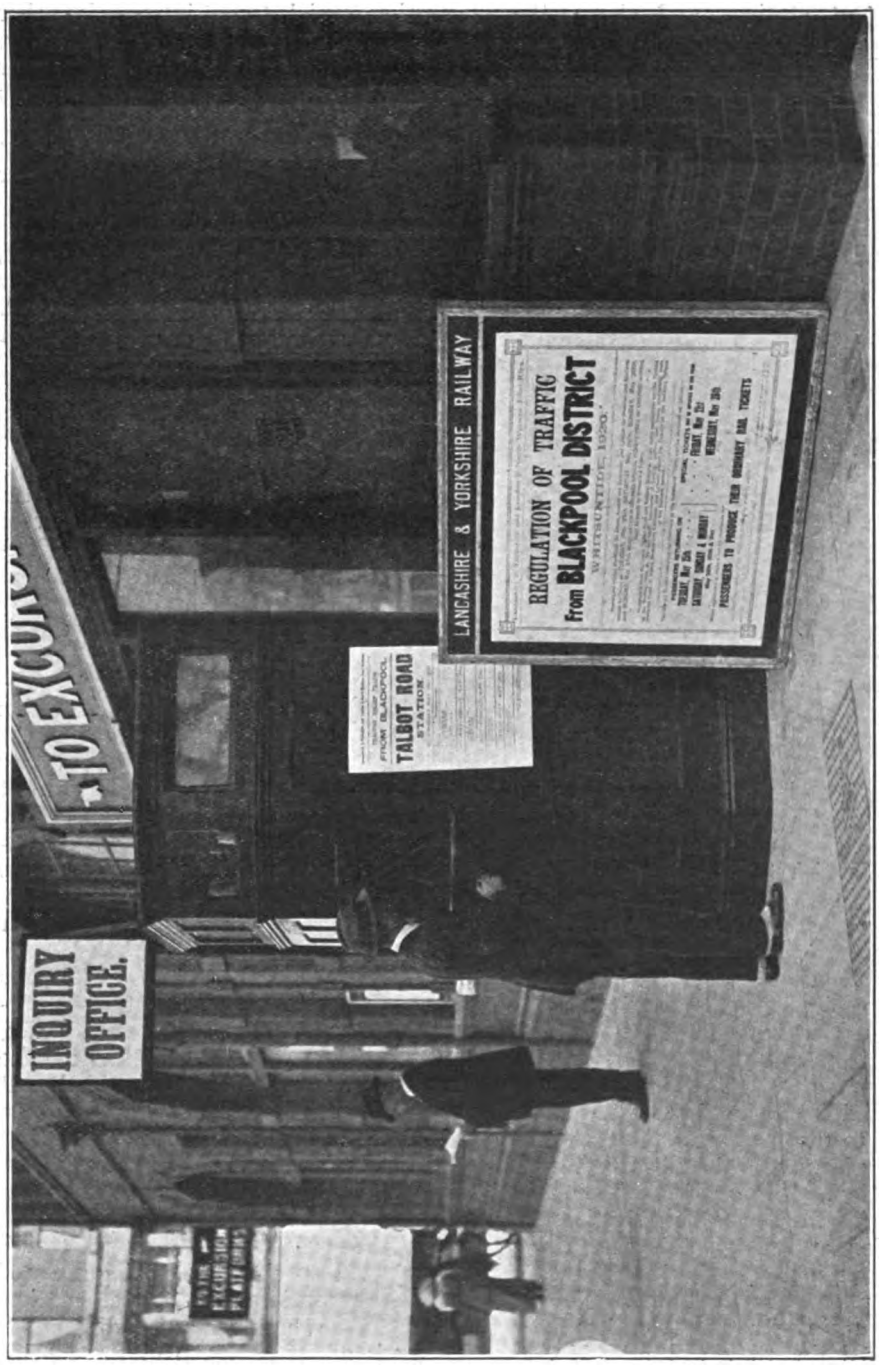

TALBOT ROAD STATION, BLACKPOOL.

Inquiry Office located at entrance in connection with the regulation scheme.

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During the Whitsuntide, 1920, period, when the return journeys were regulated on four days, 75,837 special tickets were issued at Blackpool and coast line stations, 23,817 (including 3,222 "linked" tickets) being issued for Whit Tuesday. The average loading for the additional trains throughout the period was 575, and as the standard accommodation is 664 it will be observed that the arrangement permitted all passengers to travel in comfort while the railway company avoided the running of any lightly loaded trains. Incidentally, it might be added that while 22 conditional trains were arranged, only three were run, this fact of itself indicating how economy of working is ensured by such a scheme of regulation.

LINKING OF TRAINS.

In order to minimise the work at Blackpool, which is naturally the scene of greatest activity in connection with the regulation scheme, for it is there that the majority of the regulated passengers book for the return journey, an ingenious arrangement has been put into operation to curtail the amount of booking.

It is especially useful in regard to town holiday traffic, when large numbers of people are proceeding from any one town or district to Blackpool. As this is a heavy traffic which has to be given a specially strengthened service for the time being, the booking clerks at the home stations or town agents in issuing the advance travel tickets to Blackpool, arrange with the passengers by which train they will travel on the return journey. In such cases, the ticket bears two distinct numbers, one on the outward half showing the scheduled number of the train towards Blackpool, and the other on the return half giving the train by which they are booked on the return journey.

This procedure has the obvious advantage of definitely booking up "block" trains between the two points, and thus avoids the necessity of advertising such return trains in connection with the general return arrangements. To illustrate the extent of the work, an instance may be quoted from the 1919 season when, on August 16, 45 trains were run from a particular district to Blackpool, and conveyed 28,556 passengers, with the good average loading of 635 passengers per train. Of this number 27,182 were linked in the manner described for their return journey on August 23; thus over 95 per cent. of the passengers from this district were regulated before they started on both the outward and return journeys. The remaining passengers, numbering 1,374, carried by these trains may have been returning on non-regulated days, or staying at Blackpool longer than the week—Saturday to Saturday. If, however, they desired to return on a regulated day, it would be essential for them to obtain a special ticket for the return journey from Blackpool Central.

A somewhat similar arrangement is adopted in connection with passengers travelling between Preston and the Blackpool area on regulated days. Preston is a joint station with the London and North Western and as the regulation scheme does not apply from this point the passengers are booked by ordinary service from Preston. In order to ensure full loading of trains on the return journey, and to render it unnecesasry for the day passengers to spend part of their time in obtaining a special ticket for the return journey, they are afforded an opportunity, when booking at Preston, to be linked to a scheduled return train. Passengers naturally avail themselves largely of this facility, and a concrete example of the manner in which the arrangement works may be quoted from the circumstances on Whit Tuesday. On this day a telegram was received at Blackpool from Preston intimating that 5,372 passengers had been booked to Blackpool, and that of this number 3,221 had been "linked" to scheduled return trains as shown: Train 161,418 passengers, &c. This information enabled the regulating officer at Blackpool to make arrangements for 1,437 tickets, making full allotments for the seven trains in question to be put into circulation, some at coast line stations and others at Blackpool, the result being that 1,330 were issued. The seven scheduled return trains each had seating accommodation for 664 passengers, totalling 4,648, and as 4,551 passengers travelled by them on the return jurney it will be seen that almost the maximum loading was obtained. This is one of the special points of the scheme, and it is our opinion that, in the event of excursion travel being

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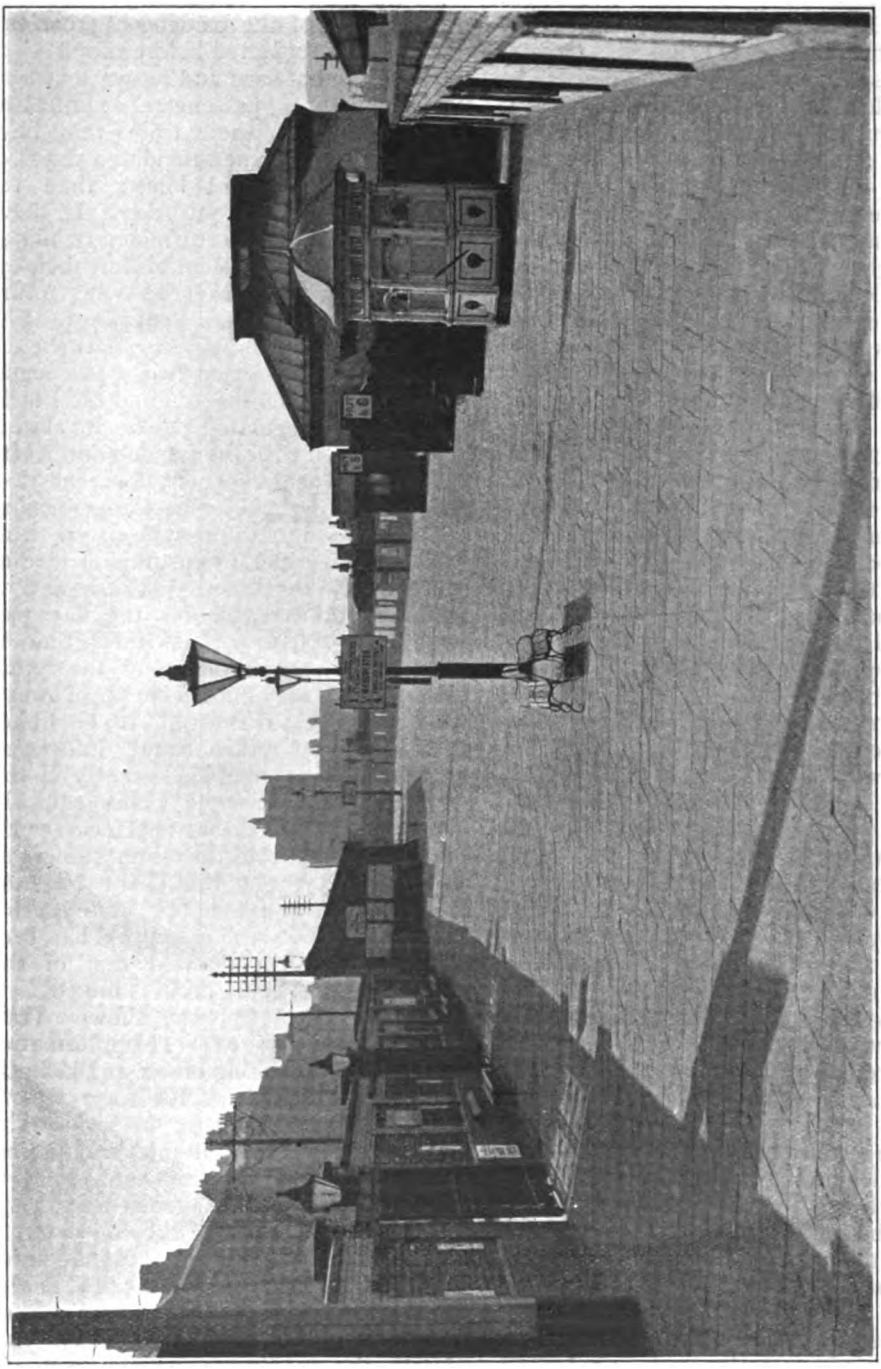

EXTENSION CONCOURSE AT BLACKPOOL CENTRAL.

Showing arrangements at Booking Huts for Special Tickets and Inquiry Office. Barriers to "Excursion" Platforms are seen in the background.

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re-introduced, all passengers taking advantage of the facility should be required to book linked tickets. Apart altogether from the advantages to the railway companies, it is indisputably in the interest of passengers that this should be done, as the system ensures comfort and punctuality—the two prime essentials in railway travel.

Station Working at Manchester and Blackpool.

Under the old conditions of working, there was a good deal of congestion, both at Manchester and the two Blackpool stations. Large crowds foregathered at the stations well in advance of train departure times in order that they might have an opportunity of getting a seat, and when a train entered the station there was, if not actual confusion, a great deal of crushing. All this has, however, been altered under the new arrangements, and passengers travelling on regulated days leisurely pursue their way to the trains and just as leisurely take a seat. To those who have had experience of attempting to get in a train at holiday time, this sounds almost too good to be true, but we can assure the sceptical reader that this is not a fairy tale. It is a true record of actual facts, based upon personal observation.

When passengers congregate in advance of the train time—as they do, despite the supplications of the railway company, they have to be formed into a queue. Victoria Station is a large terminal for Manchester traffic as well as a through station for east and west traffic, and as the passengers waiting for the Blackpool (and Southport) trains would impede the circulation of other passengers if allowed to crowd round the barriers, they are formed into queues away from the platforms. They are not kept there any longer than is really necessary. As soon as one train for Blackpool has departed, the passengers for the next scheduled train are permitted to pass through the barriers. It will readily be seen that passengers for two Blackpool trains must not be allowed on the one platform together, else the whole idea of the scheme, from the standpoint of public comfort, would be negatived. Additionally, the fact that the station platforms are kept clear in this way enables the operating staff to work more freely, and so tends to the rapid despatch of station duties.

We were particularly impressed with the smoothness of the working at Victoria, and with the celerity and ease with which passengers pass from the circulating area through the barriers, from the platforms to the train, and finally commence their journey. We have personally experienced the troubles due to congestion more or less usual at busy periods in pre-regulation days, and know how this must have reacted unfavourably on the working of the traffic and the arrangements generally. The new system works like a well-oiled machine. As soon as one scheduled train has left the station the passengers for the next train are passed through the barriers at the rate of about 75 per minute, and within 10 or 15 minutes are comfortably seated in the train ready for the journey. To walk down the platform as the time of departure draws near and to note that, while each compartment carries its full complement—although there is no crowding—is a real joy to the railway operating enthusiast. Here one has commercial and operating co-operation *par excellence*. Fully loaded trains, prompt starts and punctual arrivals! What more is to be desired? As a train draws out the platform is empty, save for the railway staff, but is soon again invaded by a regulated train load of passengers who know there is accommodation for them on the next train, and that they are to enjoy comfortable and punctual travel.

From a traffic working aspect, Blackpool stations have gained appreciably by the introduction of the regulation scheme. Unlike Manchester (Victoria), which is a through station, both Talbot Road and Central Stations at Blackpool are terminals, and having in previous days been provided with considerable accommodation for large-scale excursion traffic, many of the difficulties attendant on the working of the scheme at Manchester are avoided.

Talbot Road has 15 platform lines, with a total platform length of 9,900 ft., while Central has 14 platform lines with a platform length of 8,888 ft. It will thus be seen that they have ample room for the segregation of the traffic in accordance with destination, and this is a distinct advantage in working the regulation scheme. The allocation of platforms is

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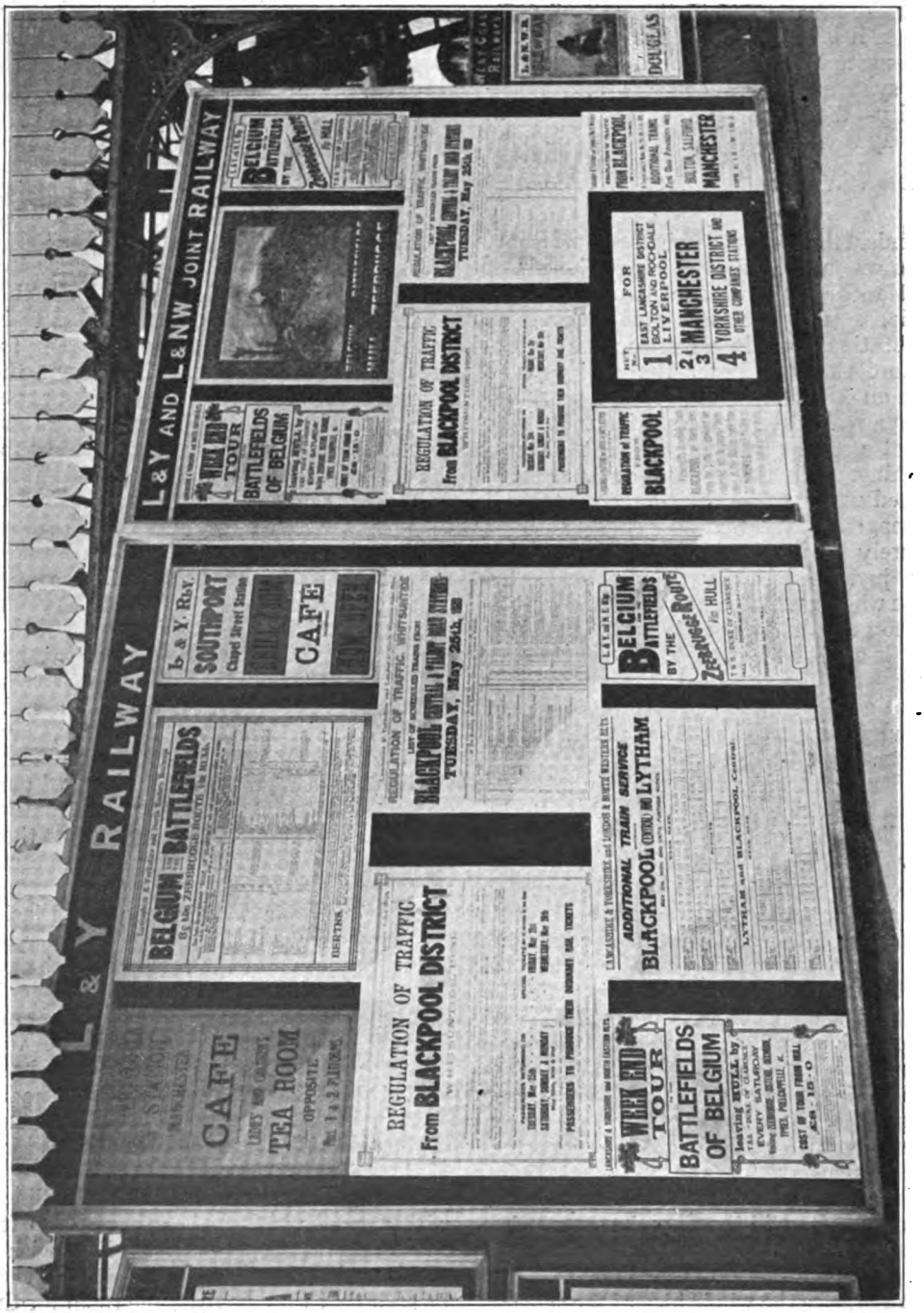

DISPLAY OF POSTERS AT CENTRAL STATION, BLACKPOOL.

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arranged carefully in order that no two trains for the same destination areas are alongside together, and the general result is that the passengers are very speedily and effectively marshalled into the scheduled trains for which they hold special tickets. Each platform barrier is provided with a notice board, which shows in large block letters the scheduled number of the train next departing from that platform, the destination and stopping places and the time of departure. As, moreover, inquiry kiosks are provided both at Talbot Road and Central, every facility is offered to the passenger. As the ordinary and excursion platforms are used indiscriminately in connection with the station occupation of scheduled trains, it is not usually necessary to keep the passengers waiting in the circulating area, as they can be admitted to the platform well in advance of train departure time. When this is necessary they are formed into queues for easy handling.

The tremendous improvement effected in the work at the Blackpool stations cannot properly be appreciated except by those who had an opportunity of observing the conditions prior to the regulated scheme of controlling travel. Suffice it to say that the innovation has reduced the working almost to a science and that where a state of confusion and something like chaos was usual at busy periods, there is now an orderliness and smoothness of working that is naturally reflected in the more effective handling of the traffic. The station officials at Blackpool are extremely keen on the regulation scheme. In conversation with one of the station superintendents we were given an opinion of the scheme which we quote as being in accordance with our own conclusions. "The regulation arrangements certainly mean more detail work, but this is abundantly justified by the smoothness of station working on the regulated days."

Regulation Represents Operating Economy.

Apart from ensuring the comfort of passengers on regulated days, the employment of the scheme enables the railway company to effect considerable economy in operation. This is possible by means of the centralisation of all available information at Blackpool Central, an expert operating official there being located with a small staff to adjust the working of trains and rolling-stock. This office is connected with the Control, and is, therefore, in direct touch with the 300 Lancashire and Yorkshire stations falling within the scope of the regulation scheme.

As it is the first duty of this official to co-ordinate the workings to the best advantage in accordance with the requirements of the traffic, it is essential that he should be supplied with all possible information as to the rate at which trains are being booked up and as to the general flow of traffic. This is supplied by the T.R. department, and on an analysis of this information, it is for the operating section to decide whether the additional trains should have their workings altered in order more economically to convey the traffic offering, whether the conditional trains should be placed in service, or the strengthening of additional or ordinary trains be resorted to, and, generally, to make such arrangements as will permit of the traffic being carried in the most economical manner consistent with efficiency.

It is difficult, if not impossible, to compute the actual saving due to train working adjustments, but that the avoidance of light running and the cutting out of trains represents considerable economy will readily be admitted. During our observations at Whitsuntide, we were able to obtain a very clear idea of the possibilities of the regulation scheme in securing the utmost economy in operation by the meticulous adjustment of the workings, and to note how engine power and rolling-stock were conserved by this means. Space forbids an elaboration of the adjustments in the "workings," but it may be said that the Whitsuntide changes were very considerable and that they would doubtless show appreciable operating economy when the results were collated.

The special point to be emphasized in this connection is that the traffic requirements were known well in advance, and it was a relatively simple matter to make these alterations with an ample margin of time and without confusion. Despite all the changes made in the workings during the period, the percentage of unpunctuality was very low,

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the average late start being less than one minute, and the average late arrival being considerably less than 10 minutes. In this connection it should be observed that, actually, on proper schedules for the work performed, the late arrivals which raised this average even so high, would not have occurred. What happened was this: A train, booked to run non-stop from Manchester to Blackpool on an express schedule, would be stopped, say, at Bolton and Preston or some other point in order to clear traffic booked for another train that did not book sufficiently well to warrant the running. In such a case it is obvious that the schedule should be lengthened, but the punctuality figures quoted are based on the actual schedules booked for the original workings.

Reference may also be made to the possibility of adjusting the strengthening programme, which is naturally laid down on an extensive scale to meet possible requirements. The advance information supplied to the regulating officer at Blackpool enables him frequently to reduce the strengthening ordered, and, also, by a skilful manipulation of the vehicles, to strengthen other trains in such a manner that trains not booking to reasonable capacity could be cancelled. The ordinary trains necessarily have to run, and due allowance is made for ordinary traffic in arranging allocations for tickets available on such trains. The loading of these trains varies considerably, because they do a good deal of intermediate work, and also convey passengers for Morecambe and other places which do not fall within the scope of the regulation scheme. The loading of the additional and conditional trains is, however, a matter for the most careful arrangement, and when it is pointed out that the average loading of these trains was 575, and that this compares with 488 for the 1919 season and 456 for the 1918 season, it will be evident that as the scheme develops it is becoming more obvious that great operating economies can be effected.

General Advantages of the Regulation Scheme.

The principal advantages accruing from the employment of the regulation scheme arise from the fact that the operating department can make arrangements not merely in intelligent anticipation of expected demands, but with definite advance information as to the general tendency of the traffic.

The advance booking of tickets enables information to be compiled in the T.R. department to show how many people intend to travel by specific trains on specific days, and thus permits of adequate arrangements being made to meet the requirements. This is, obviously, a much better arrangement than including in the programme trains to run as required, and finding at the last moment that they are unnecessary or that additional accommodation is essential. By the advance information supplied, it is possible to give timely information to all concerned respecting the cancellation of trains for which the bookings are light, and thus avoids the turning out of engines and men or unremunerative work, while the placing in service of additional trains can also be properly advised.

The same advantage is found in connection with the return traffic, as it is known at latest the night before the day of travel exactly how many trains will be required and arrangements are made accordingly. Under the old conditions it was essential to have trains at Blackpool to run if required, this leading to loss of mobility and frequently to unnecessary empty running. The early trains were very lightly loaded, while great crowds would try to travel on the later trains with the consequence that there was always considerable over-crowding and discomfort on heavy traffic days. The new arrangement does away with all this sort of thing, and it must be held to provide a great convenience for the public, whose comfort is increased in a very marked degree. After a passenger has booked his rail ticket for the outward journey or obtained his special ticket for the return journey, he is assured of being carried on a definite train, with the added knowledge that his co-operation in the scheme of regulation will enable him to travel comfortably and punctually. On the other hand, the railway company gains by carrying the traffic at a minimum expense. While the expenditure on advertising the scheme by means of an ambitious scheme of posters and the cost of the arrangements essential to work the scheme must be heavy, there can be no

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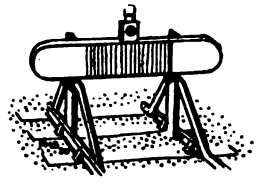
doubt that this is easily counterbalanced by the operating economies effected and by the saving in several other directions.

In past years, when there was a considerable amount of crowding, trains were booked to run from Manchester as required. Consequently, as soon as a train obtained its load it was sent off. This certainly relieved station congestion and freed the platform roads, but by no means ensured a rapid journey to the seaside. It is a well-known traffic maxim that if a train gets out of its path it is usually subjected to all sorts of incidental delays due to conflict with other trains running along other paths, and this is one of the reasons why delays accumulate so considerably in connection with such trains. Under the new working conditions, however, trains are not despatched before the booked time, and as they are adequately scheduled on proper paths they are subjected to a minimum amount of delay *en route*. In fact, during the whole of our investigation the percentage of punctuality was a very high one. In eight or ten journeys to or from Blackpool, which we made personally, time was maintained throughout on each occasion, and from our general observations we found that, except for one or two trains, the trains were starting punctually and arriving at their destinations less than one minute late.

During the whole of the 1919 season the regulated trains worked particularly well, and by leaving at their booked departure time they got into their proper paths for main line working and so avoided detention. This is abundantly proved by the reduction in engine-hours, and there is further proof in the fact that whereas, under the old conditions, trains were arriving at Manchester from Blackpool up to three and four each morning, the station during the whole of last summer generally cleared up at the latest at midnight, thus releasing staff and saving overtime, not only at Manchester, but all along the line, a most important matter in these days of heavy labour costs.

Of great importance in the regulation scheme is the general tendency for the working to permit of through point to point working with full loads. This is an obvious advantage, as it avoids intermediate station work and platform occupation, while generally assuring a quicker run. Great efforts are naturally being made to extend this form of working, for the quick succession of through trains requires a shorter line user and thus increases the capacity of the tracks. By this method, moreover, it is frequently possible to avoid bringing passengers through Manchester, a very desirable arrangement where a more direct route offers. In short, the Lancashire and Yorkshire Railway company's scheme of passenger traffic regulation is based on scientific lines, and like most other schemes that are properly devised and adequately worked, it is achieving a great success. Passengers speak very highly of the arrangements, season ticket holders, of whom there are many in the Blackpool area, thoroughly commend it, the same reasons saving for both—the assurance of comfortable travel. On the other hand, the railway company effects a saving in engine-hours and obtains a high average loading of trains.



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THE RAILWAY PORTRAIT GALLERY.

Langfier.]

MR. WILLIAM CLOWER, **MR. HARRY VINCENT MOSLEY,**

Assistant General Managers, Midland Railway.

MR. WILLIAM CLOWER and MR. HARRY VINCENT MOSLEY, hitherto assistants to the general manager, have been appointed assistant general managers Midland Railway, as from July 1.

Mr. Clower entered the service in the goods manager's office in January, 1880, and on May 14 of the same year was transferred to the general manager's office. He was appointed indoor assistant to the general manager on January 1, 1915, and principal assistant on January 1, 1919. He has been closely associated with Sir Guy Granet and Mr. Frank Tatlow, the late and present general managers respectively, in connection with the intricate problems affecting Conciliation Boards and Staff and Labour matters generally, on which he remains a high authority.

Mr. Mosley entered the service on May 4, 1896, in the general manager's office, and was appointed personal assistant to the general manager on January 1, 1919.

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Locomotive and Train Working in the latter part of the 19th Century.

NORTH BRITISH RAILWAY. [No V.]

By E. L. AHRONS.

WHEN Mr. Holmes succeeded Mr. Drummond in 1882, he made certain changes in the appearance of the engines. The much neater Drummond cabs of the Stroudley pattern were gradually replaced by plainer ones of the Stirling type, and the Ramsbottom valves on the domes were abolished, and in their place appeared two short columns containing lock-up valves. The colour of the engines was afterwards altered to a gamboge-brown, and the names on the passenger engines were promptly painted out.

The first passenger engines which Mr. Holmes put into service were Nos. 574 to 579 with 6 ft. 6 in. coupled wheels, 17 in. by 26 in. cylinders and leading bogies. They were built at Cowlairs in 1884 and were smaller and lighter engines than Mr. Drummond's 476 class. The coupled wheels were spaced 8 ft. 3 in. apart as compared with 9 ft. in the 476 class. The 574 class had a heating surface of 1,059 sq. ft., a grate area of 17½ sq. ft., and carried 140 lb. pressure. I know very little of the work of these engines, but they were frequently to be seen between Glasgow and Edinburgh.

The next class consisted of 12 very handsome 4-4-0 express engines with 7 ft. wheels, 18 in. by 26 in. cylinders, and 140 lb. pressure. The total heating surface was 1,136 sq. ft., but the fireboxes were of comparatively large size and contributed 119 sq. ft. to this total, with a grate area of 21 sq. ft. The weight in working order was 46 tons. Of this class 592 to 597 were built at Cowlairs in 1886, and 598 to 603 in 1887, and the first of them, No. 592, was shown at the Edinburgh exhibition of 1886. No. 602 was adorned with the Prince of Wales's feathers in honour of having taken the Royal train, when the late King Edward, then Prince of Wales, opened the Forth Bridge in 1890.

When the second Tay Bridge was opened in 1887, Nos. 593 to 598 were put to work on the rearranged train service between Aberdeen and Burntisland *via* Dundee, some of the engines being stationed at each end. After the exhibition, No. 592 was employed on a new service between Dundee and Glasgow. The Edinburgh and Glasgow trains from Aberdeen were combined, the two portions being usually separated at Thornton Junction, whence the Glasgow portion ran *via* Dunfermline and Alloa. The Forth Bridge was not yet completed and therefore to accommodate those passengers who objected to the ferry crossing from Burntisland, a through carriage for Edinburgh was always attached to the rear of the Glasgow train. Certain E.C.J.S. through coaches for London from Aberdeen also followed this route.

In August, 1888, the best down train left Edinburgh at 9.30 a.m. Leaving Burntisland at 10.25 a.m. it reached Dundee (Tay Bridge) at 11.44 a.m., a distance of 39 miles with five intermediate stops. It arrived at Aberdeen at 1.55 p.m., having taken 2 h. 5 m. for the 71½ miles from Dundee with three intermediate stops. The longest run—40½ miles—from Montrose to Aberdeen was booked in 68 minutes, but the best up train which left Aberdeen at 1.20 p.m. was faster over this section, and was timed for the run to Montrose in 61 minutes. Nevertheless it required 5 minutes more for the journey to Dundee.

Mr. Holmes built twelve tank engines for passenger traffic almost similar to Mr. Drummond's "88" class, with four-coupled leading wheels 5 ft. 9 in. diameter and trailing bogies. The cylinders were 17 in. by 24 in., the total heating surface 1,026 sq. ft., boiler pressure 140 lb., and the

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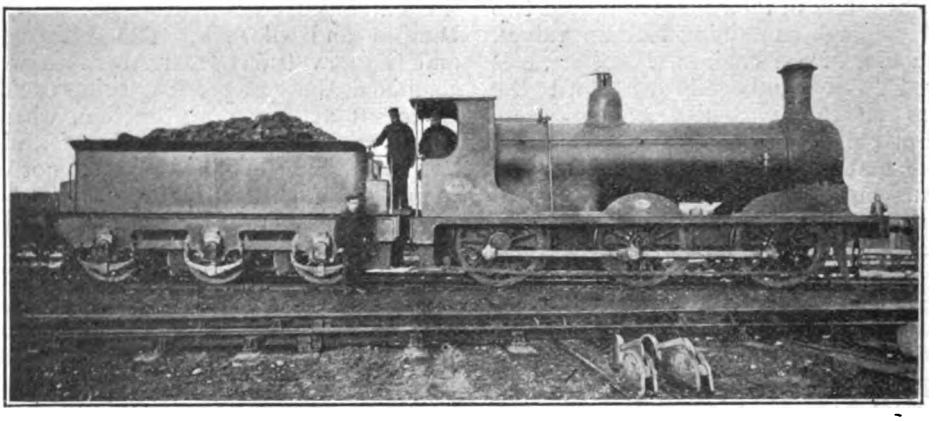
weight in working order 50 tons. The last six engines of the class had 1,059 sq. ft. of heating surface. These engines were all built at Cowlairs, Nos. 586 to 591 in 1886, and 90 to 95 in 1888.

Perhaps the quaintest phenomenon on the old North British of the 'eighties and early 'nineties was the woe-begone expression on the faces of the traffic staffs of some of the stations when a train came into sight When it arrived, usually much behind time, (for North British unpunctuality was if anything rather worse than that of the lines south of London), the mental attitude of the station staff seemed to be " Oh ! hang it all ! here is another of those confounded trains—what on earth are we to do with it ? " And what they did with it was not much ; one lot of passengers sorted themselves out of the carriages, whilst another lot sorted themselves into them, and finally, after much delay, the train somehow or other sorted itself out of the station to the accompaniment of a fervent " Nunc dimittis " on the part of the staff, after which a somnolent, placid atmosphere once again descended upon the station until the arrival of the next intruding train.

The old Waverley station was much the worst, but the fault here lay not so much with the officials as with the miserable accommodation. Foxwell (" Express Trains English and Foreign," 1888) gives the following description of it which, though it admittedly does but scant justice to the chaos, is worth quoting. " On the platforms of the Waverley station at Edinburgh may be witnessed every evening in summer a scene of confusion so chaotic that a sober description of it is incredible to those who have not themselves survived it. Trains of caravan length come in portentously late from Perth, so that each is mistaken for its successor ; these have to be broken up and remade on insufficient sidings, while bewildered crowds of tourists sway up and down amongst equally bewildered porters on the narrow village platform reserved for these most important expresses ; the higher officials stand lost in subtle thought, returning now and then to repeated enquiries some masterpiece of reply couched in the cautious conditional, while the hands of the clock with a humorous air survey the abandoned sight, till at length, without any obvious reason and with sudden stealth, the shame-stricken driver hurries his passengers off into the dark. Once off, the driver and the engine do much to make us forget the disgraceful rout from which we have just emerged, for the North British engines, especially those which work the Midland trains to and and from Carlisle, achieve some of the very best express running in the world—over such hills."



0-6-0 LOCOMOTIVE No. 473.
Designed by Mr. D. Drummond and built by Neilson & Co., 1876. Cylinders, 18 in. by 26 in. Coupled wheels, 5 ft. diam.

The best long distance express in 1888 was the down night Tourist train, which left Carlisle at 3.33 a.m. and ran through to Edinburgh, 98½ miles in 2 h. 20 m., the

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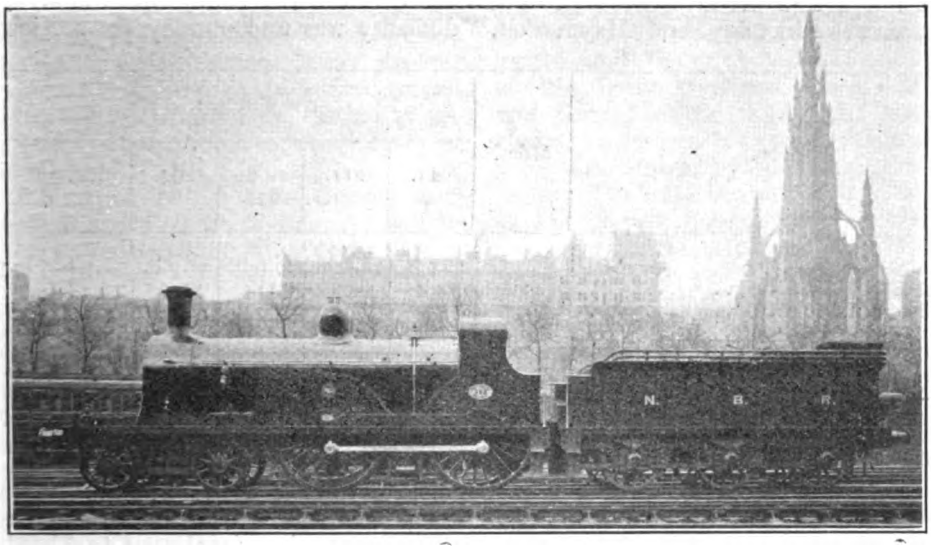
same time allowance as was given 10 years before. Between Edinburgh and Glasgow there were rather more fast trains which averaged 44½ m.p.h. between Edinburgh and Cowlairs. The through Glasgow and Dundee trains averaged 43 m.p.h. between Alloa and Thornton Junction, but the remainder of the so-called express service was of a very poor quality. The best trains between Edinburgh and Dundee, and Aberdeen have already been mentioned.

The year 1888 was that of the first Scotch racing trains between London and Edinburgh, but these were confined to the East and West Coast routes. The Midland and North British* being at a disadvantage did not compete, but confined themselves to accelerating the down day express, the 10.40 a.m. from St. Pancras, though for this acceleration the Midland was responsible over the London–Leeds section. This train left Carlisle at 5.54 p.m. but did not reach Edinburgh until 8.24 p.m., its best run being from Carlisle to Hawick at the rate of 42½ m.p.h. From Galashiels to Edinburgh its speed was 40.6 m.p.h.

The actual speeds attained on the Edinburgh and Glasgow section—an almost dead level line from Edinburgh to Cowlairs—were not so good as might have been expected seeing that most of the trains were fairly light. With one of the 592 class, 7 ft coupled and eight six-wheeled coaches the speed from passing Bishopbriggs to a stop west of Haymarket worked out at 51½ m p.h. of which the best running was between Bishopbriggs and Polmont, over which section the average was 53⅛ m.p.h. It must however be stated that the engine gained time to Haymarket, and more could not be expected. The run from Glasgow to Edinburgh including the ascent of the Cowlairs incline could easily have been done by non-stopping trains in one hour.



4-4-0 LOCOMOTIVE No. 592.

Designed by Mr. M. Holmes and built at Cowlairs, 1886. Cylinders, 18 in. by 26 in. Coupled wheels, 7 ft. diameter.

The most important event in the history of the North British at this period was the opening of the Forth Bridge in March 1890. The bridge itself is owned jointly by the North British, the Midland, and the two East Coast companies, but the approach lines which had to be constructed are the property of the North British. The lines in Fifeshire had to be improved by the shortening of some awkward corners, and finally, in order to give

* In one sense, of course, the North British was a partner in the racing competition since the East Coast trains ran over its line from Berwick to Edinburgh, but they were worked by North Eastern engines.

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better access to Perth an entirely new railway had to be constructed from Mawcarse down Glenfarg, six miles of which descend towards Perth on a gradient of 1 in 74½, and joined the old line from Ladybank Junction at Bridge of Earn.

The result was that the service of trains between Edinburgh and the north was vastly improved. In 1891 the fastest down train which left Edinburgh at 4.32 a.m. (the Tourist express) ran through to Dundee where it was due at 5.47 a.m., and thence travelled to Aberdeen with two stops in 1h. 50 m. The fastest up train the 6.20 a.m. from Aberdeen reached Dundee at 8.5 a.m. with three intermediate stops but was slower to Edinburgh as it stopped at Kirkcaldy and Haymarket.

tons were carried on the coupled wheels. Twelve more of these engines were built in 1894–5 with 150 lb. boiler pressure, which are numbered 262, 293, 312, 404, and 211 to 218.

During the 1895 "Race to Aberdeen" these were the engines employed between Edinburgh and Aberdeen, and usually they ran right through, but occasionally a change of engines was made at Dundee. The following tabulated statement shows the speeds run by certain of the racing trains, and it should be borne in mind that there were a considerable number of obstacles to free running. Service slacks had to be made at Ladybank Junction and over the Tay Bridge, but the greatest difficulty was undoubtedly the section of

Run.	Miles.	Engines.					
		211.	211.	312 and 639.	293.	262.	(?)
		m.p.h.	m.p.h.	m.p.h.	m.p.h.	m.p.h.	m.p.h.
Edinburgh to Dundee	59¼	50·4	50·25	51·4	55·75	—	60·25
Dundee to Arbroath	17	53·6	52·3	50·7	—	—	—
Arbroath to Aberdeen	54¼	47·1	50·4	54·1	—	—	—
Dundee to Aberdeen (without stop)	71¼	—	—	—	—	53·75	56·25
Load (tons)		125	147½	155	105	105	(?)

This train formed part of the up East Coast Scotch Express which left Edinburgh at 10.0 a.m., and reached King's Cross at 6.30 p.m. The speed of the non-stop down express from Edinburgh to Dundee (59¼ miles) was 47.4 m.p.h. Between Edinburgh and Perth 47¾ miles the best down train took 67 minutes, an average speed of 42.6 m.p.h.

To work these trains north of Edinburgh, Mr. Holmes built 12 4-4-0 express engines with 6 ft. 6 in. coupled wheels, Nos. 633 to 642, 36 and 37. They had 18 in. by 26 in. cylinders and boilers with 1,148 sq. ft. of tube heating surface, and 118 sq. ft. of firebox heating surface, giving a total of 1,266 sq. ft. The weight in working order was 45 tons 18 cwt. of which 30¾

single line between Arbroath and Kinnaber Junction where the North British terminates, the remainder of the run to Aberdeen having to be made over the Caledonian railway.

It will be noticed that the speeds shown in the later portion of the table were much better than the earlier ones, since the time tables were changed from day to day as the trains were gradually accelerated. The speeds shown in the last three columns were marvellous considering the great difficulties of the road. I regret that I have no record of the engine which ran from Edinburgh to Dundee at 60¼ m.p.h.; this was probably the same engine as performed the 56¼ m.p.h. run from Dundee to Aberdeen the same night.

(To be continued.)

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The Future of British Railways.

EVER since the first steps were taken towards the establishment of what is now the Ministry of Transport, speculation has been rife as to the way in which the future development of British railways would proceed, and the fact that until now there has been no basis upon which to found future policy has markedly hindered the evolution of the post-war transport and industrial situation so essential to progress. Indeed, it may be said that the absence of a definite policy, in conjunction with the inevitable difficulties of the transition period through which we are passing, has given rise to many popular misconceptions and has afforded ground for an active propaganda distinctly adverse to railways and to the Ministry of Transport.

Publication of Sir Eric Geddes' proposals for the future of railways will do much to mitigate the general atmosphere of uncertainty. At the same time, it has to be borne in mind that, as the title of the White Paper indicates, it is not a complete scheme, but an "Outline of Proposals as to the Future Organisation of Transport Undertakings in Great Britain and their relation to the State." As such the proposals offered must be accepted on a reasonable basis—an outline of policy expressed in general terms, although admittedly realisation will involve many difficulties. And if we interpret the scheme aright, it is not claimed that as now presented it will achieve all that is aimed at, but that it is a first stage upon which subsequent straightening-out and adjustment may be based. For example, the proposed amalgamations of existing companies will not in themselves remove the anomalies of the present situation, nor will it eliminate the possibilities of competition. Such amalgamations will still leave the combined companies with lines penetrating in all directions into one another's territories, providing alternatives for traffic in regard to many of the chief centres, with the complications of running powers and joint ownership, and with standard and well-recognised through train services, the withdrawal of which no one would contemplate.

It is, therefore, as a means to an end that the proposed grouping of companies must be regarded, as a first step necessary before the different problems of future adjustment.

Grouping of Railways.

The idea of grouping railway companies is by no means a new one. Many schemes have been produced from time to time, while the South Eastern and Chatham Managing Committee, the London and North Western, Midland and Lancashire, and the Great Western and London and South Western alliances or working agreements, and the proposed amalgamation of the Great Northern, Great Eastern and Great Central Railways, represent concrete measures in that direction voluntarily undertaken by the companies concerned. Indeed, the essential difference in this respect between the situation as it was before the war and that now existing is that State policy has been reversed. Conditions are essentially changed, it is true, but the fact remains that measures which were regarded as inadvisable, permitted more or less grudgingly if at all, or directly refused, are now advocated by the Government itself.

In one respect most of those who have ventured to prophecy the lines which proposals for the grouping of railways would follow, have gone astray. That is, in reference to the placing of the North Eastern Railway, presumably with the Hull and Barnsley Railway, in a group by itself. This course is distinctly justifiable in that the North Eastern Railway in itself accords most nearly with a territorial allocation, and penetrates to a relatively very limited extent into the areas served by other groups. In other respects the proposed grouping of the companies is a fairly reasonable one, at any rate any alternatives will be subject to the same or similar criticism. The chief anomaly, if it can be so termed, is No. 6 *London Group* (local lines). If this covers only the Underground and tube lines it will constitute a very small group; whereas if it is to include all lines within a given area, a very difficult problem will be involved as to how to

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divide off these sections from the railways in other groups, for some of which the London suburban traffic is the most important, if not the most valuable part of their work.

There is, however, no need to pursue this aspect further, for many of the problems involved must be solved before the scheme becomes an accomplished fact, and it will be sufficient to state the proposed grouping as follows :—

The Irish railways naturally fall to be dealt with under the new legislation in regard to Ireland. The groups will be determined on the basis of operating economy, and all direct competition between the groups will, as far as possible, be eliminated. The groups which it is proposed to form are roughly:—

1. *Southern*, combining the South Eastern and Chatham, the Brighton, and the South Western.

2. *Western*, the present Great Western system with the Welsh lines.

3. *North Western*, combining the North Western, the Midland and the Lancashire and Yorkshire, North Staffordshire and Furness.

4. *Eastern*, combining the Great Northern, the Great Central, and the Great Eastern.

5. *North Eastern*, the present North Eastern system and the Hull and Barnsley.

6. *London Group* (local lines) ; and

7. *Scottish Group* for the whole of Scotland.

In each case the new group would absorb the smaller and independent broad gauge lines within its area, but railways which may be classified as "light," whether existing or future, will be wholly excluded from this grouping arrangement, and proposals with regard to these light railways are indicated later.

The White Paper goes on to state that "it is hoped that the amalgamation of companies in the respective groups will be carried out voluntarily; but as the scheme depends on the amalgamations, powers will be sought in a future Transport Bill to compel amalgamations (on terms, failing agreement, to be settled by some tribunal), in any cases where they are not voluntarily completed in a reasonable time to be specified."

"It is recognised that a more logical grouping of the existing systems might result if regard were had exclusively either to geographical or to operating considerations; but the amalgamation of complete undertakings as the initial step will avoid many of the difficulties which would arise if undertakings had to be divided. It would be open to the new group companies to exchange between themselves lines which project from the territory of one group into that of another, and at a later stage it may become necessary to require them to do so."

Management and Operation.

The affairs of each group are to be administered by a board not to exceed 21 members. Necessarily the shareholders, as the proprietors, must have a majority, and it is suggested that a proportion should hold large trading interests. In addition, however, there are to be representatives of employees, one-third of these to be leading administrative officials of the group, to be co-opted by the rest of the board, and two-thirds members elected from and by the workers on the railway.

In regard to finance it is suggested that the Act of Parliament which will be required before the scheme can become effective, should lay down the principle that rates and fares should be fixed on the principle that, with efficient and economical management, a net revenue can be earned "substantially equivalent on some pre-war basis to be settled by the Act, to the combined net revenue of all the companies absorbed in the group." It remains to be seen how this arrangement will work out where a railway which, for example, has only been able to pay partial or low dividends becomes associated with one which has consistently paid satisfactory dividends upon all stocks. A system of proportionate conversion would remove such anomalies in regard to the stocks and shares themselves, but the basis of net revenue would not avoid the fact that a prosperous company would thus have to assist its poorer co-partner.

The expectation is expressed that by care and economical management surplus revenue would in due course be realised, and the view is held that the State should have a prescribed share in such surplus, a suitable sliding scale being suggested.

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Advisedly it is contended that any surpluses thus accruing to the State should not go into the general revenue of the country, but should be ear-marked for railway and transport development.

Rate-Fixing Machinery.

It is comforting to note that although complete revision of the basis of railway fares and charges is to be undertaken—under the Statutory Rates Advisory Committee is now engaged upon the work—the reduction of rates is seriously contemplated, whatever may be necessities of the moment. It is, however, held that the complex procedure must be "flexible," and at the same time one which will "command the confidence of railways and traders."

The Government does not propose to give to the railways any financial guarantee. It proposes to set up a flexible rates machinery, which will enable appropriate charges to be levied, and to leave the railway companies to rely upon this machinery for the maintenance of the financial position of the groups at the level agreed.

The earnings of the railways must, of course, be subject to the normal fluctuations of traffic and to the express stipulation that the undertakings are being managed with due care and economy. This stipulation is considered essential to the protection of the public; but on the other hand it is proposed to grant to the companies a right of appeal to a judicial tribunal if the Minister of Transport refused, upon their application, to put the machinery for revising rates in motion.

Wages and Working Conditions.

It is proposed to provide by the Bill for a permanent machinery to deal with questions of railway wages and working conditions, on the lines of the two Boards which have been established temporarily by agreement, namely, the Central Wages Board, consisting of equal numbers of managers and men with an appeal to the National Wages Board, consisting of four managers, four men, and four users of the railway, with an impartial chairman.

Future Powers of the State in Relation to Railways.

It will be proposed to confer certain powers upon the State in relation to railways. These powers may be conveniently grouped under the following headings:—

(*a*) For the protection of the public.

(*b*) For the economical working of the railway systems of the country.

(*c*) To safeguard national interests.

A general review of proposals under these heads is given, but need not be considered in detail. They cover, mainly, powers previously held by the Board of Trade or covered by those already vested in the Ministry of Transport, with others essential if the railways are to be directly controlled by the State and in regard to measures considered to be necessary to carry out the general policy of co-ordinating railway interests with those of travellers, traders and the State.

Light Railways.

It is proposed to exclude light railways from the grouping arrangements. They must rely largely for their prosperity and goodwill upon the co-operation of associated main line companies, but if they progress so far as to become actual competitors therewith provision is made for their being taken over.

Docks and Canals.

There is no present intention of altering the status of the dock undertakings of the country, but some of the temporary powers conferred upon the Minister of Transport by the Ministry of Transport Act, 1919, in connection with non-railway owned docks, should, in their opinion, be retained and extended to railway-owned docks. The future of canals involves questions of great difficulty and complexity. The best advice available is being sought, and the whole subject investigated by a Committee which has been set up under the chairmanship of Mr. Neville Chamberlain, M.P., and pending the receipt of the report of this Committee, the Government feel that they are not in a position to formulate a policy.

* * *

That the proposals outlined will meet with general approval cannot be expected; but we welcome them as a serious attempt to deal with a most difficult problem. Railways were sacrificed to national interests during the war period in ways which applied to no other industry; it is the duty of the nation to facilitate any measure which will enable them to be placed upon a sound footing once more.

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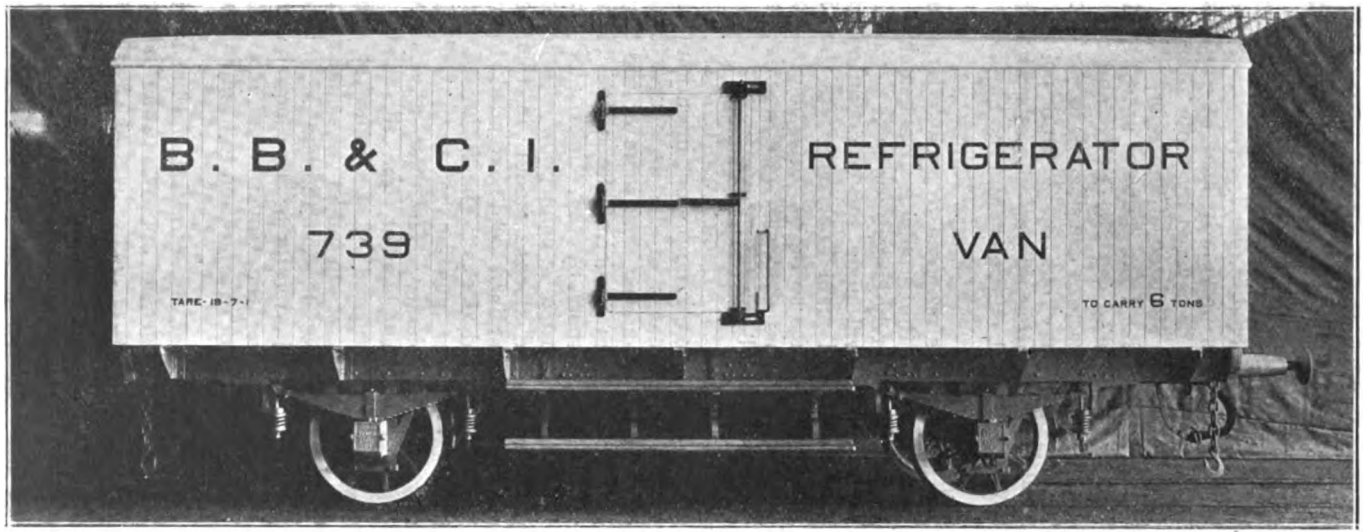
BOMBAY, BARODA & CENTRAL INDIA RAILWAY: NEW REFRIGERATOR VAN.



ONE of two new refrigerator vans recently constructed in the Parel workshops, for the carriage of dairy produce on the broad-guage section of the Bombay, Baroda and Central India Railway, is illustrated. General arrangements for icing are similar to those in use on railways in America, but owing to the high temperature experienced in India, a greater thickness of insulating material has been employed in their construction than is usual in refrigerator van work. On account of the high humidity experienced in the region through which these vans will operate, no reliance has been placed on air spaces for insulation, but all spaces have been filled with granulated cork. No provision has been made for ventilation in the vans, but they have been designed to allow of this feature being added later if it is required to use them for the conveyance of fruit.

The ice tanks will accommodate a total of 30 cwt. Attachments are provided at each end to enable the van to be coupled up to a pre-cooling plant. These attachments are standard with those adopted by the Eastern Bengal Railway, to enable interchange to be arranged subsequently if this is found desirable.

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The Horse-power of French Locomotives.

By LORD MONKSWELL.

EXCEPT when indicator diagrams are taken during special tests, very little is heard of the horse-power developed by locomotives. Horse-power is undoubtedly the best measure of the performance of a locomotive, but, as the resistance of rolling-stock due to velocity is known to vary according to circumstances enough to introduce the possibility of considerable inaccuracies, attempts are seldom made to calculate horse-power from a formula. When, however, the locomotive is working on a steep ascending gradient, where half, or more, of the resistance is due to the exactly calculable effect of gravity, the extent of the possible inaccuracies is greatly reduced, and the results reached by calculation are probably little, if at all, less accurate than those based upon indicator diagrams.

On several occasions I have recorded on the Caffiers bank of the Chemin de Fer du Nord performances of much more than average merit. On this bank the gradient is almost entirely 1 in 125, and if the Deeley formula for calculating the resistance due to velocity is employed it is found that that part of the resistance which is due to gravity amounted on the occasions in question to more than half of the total resistance.

The times for three ascents of the Caffiers bank (reckoned from a start from Abbeville in each case), and other particulars were :—

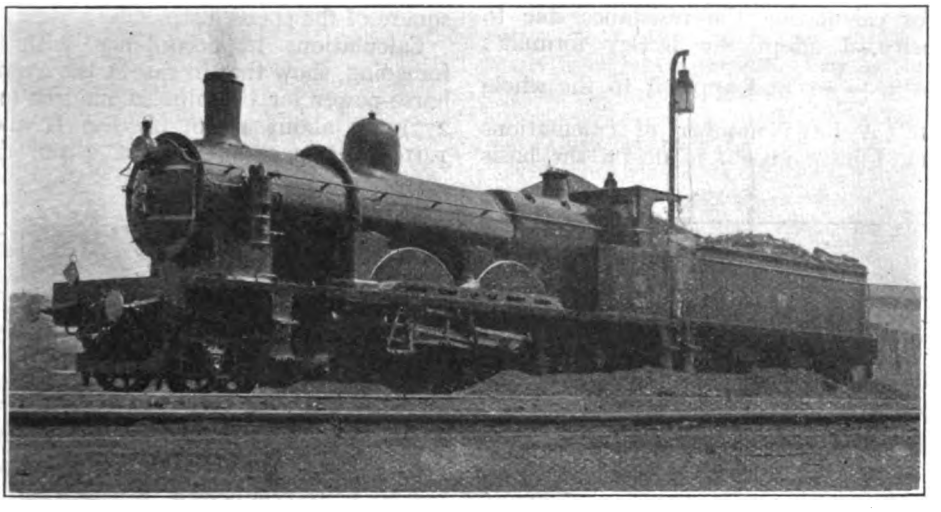

Photo.] [*Lord Monkswell.*

4-4-2 COMPOUND LOCOMOTIVE, NORTHERN RAILWAY OF FRANCE.

	A		B		C	
	Min.	Sec.	Min.	Sec.	Min.	Sec.
Post—						
268 ..	56	20⅞	59	33¼	59	26⅞
269 ..	56	51	60	7⅜	59	58
270 ..	57	23⅛	60	44⅛	60	31⅛
271 ..	57	57⅛	61	22⅜	61	6⅜
272 ..	58	34	62	2	61	43
273 ..	59	12	62	42⅝	62	20⅞
274 ..	59	51⅞	63	23	62	58⅛
275 ..	60	32⅜	64	4⅛	(missed)	
276 ..	61	15⅝	64	45⅞	64	17⅞
277 ..	61	59¼	65	27	64	57

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Type of engine.	A 4-4-2 Saturated steam.	B 4-6-2 Superheated steam.	C 4-6-2 Superheated steam.
Weight of train behind tender, officially computed, English tons..	295	296	287
Estimated gross weight of train after making allowance for coal and water used up (nearest 5 tons)	385	415	405
Average speed in miles per hour for the nine kilometres	59·4	56·6	60·9
Approximate diminution of speed between posts 268 and 277, miles per hour ..	27	16	20

The total vertical rise between kilometres 268 and 277 is 70 metres.

For calculating the resistance due to velocity, I adopt the Deeley formula: $R = 3 + \frac{V^2}{290}$, and apply it to the whole train. A large number of calculations which I have myself made on the basis of this formula, and comparisons between the results of these calculations and such published information regarding the direct measurement of train resistance as I have come across, lead me to believe that under ordinary conditions this formula gives very accurate results.

When the speed is not constant a calculation of the resistance due to velocity based on the average speed gives a result which is slightly too low. It is, however, a close approximation and, what slight error there is leading to an understatement, I have adopted it for the sake of simplicity.

When the speed falls the loss of impetus provides assistance sufficient in amount to raise the train vertically through a distance which varies as the square of the speed lost.

Calculations in accordance with the foregoing, show that in case A the average horse-power for the nine kilometres (268-277) was about 1,850, in case B about 1,910, and in case C about 2,100. The

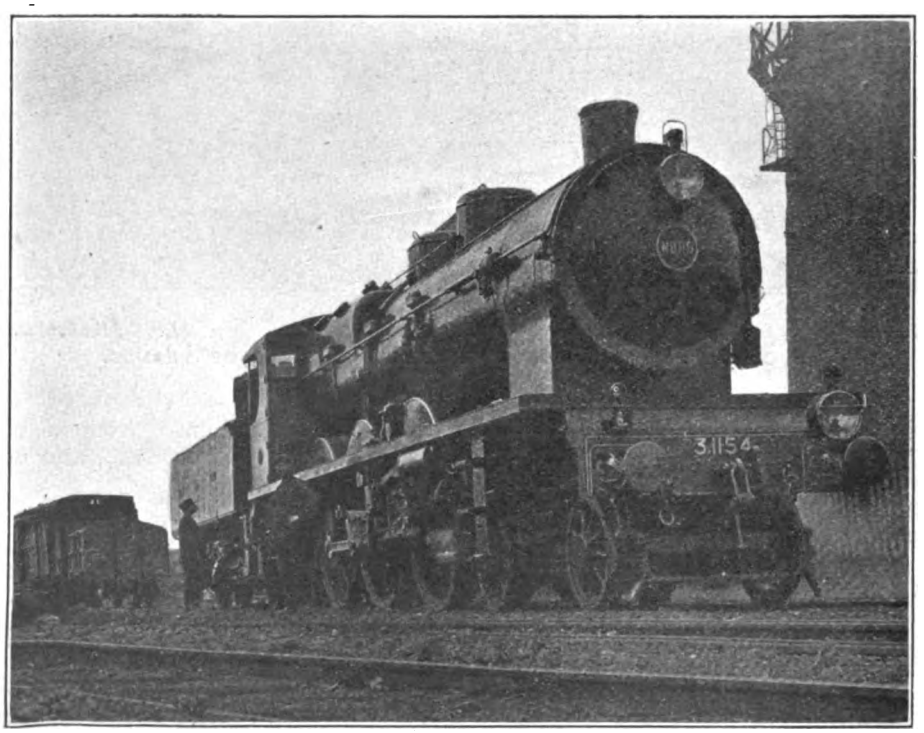

Photo.] [*Lord Monkswell.*

4-6-2 COMPOUND EXPRESS LOCOMOTIVE No. 31.154, NORTHERN RAILWAY OF FRANCE.

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weight of the 4-4-2 engine used in A was about 65 tons, that of the 4-6-2 machines used in B and C about 84 tons. The horse-power per ton of engine was therefore in the three cases about 28½, 23 and 25.

In all three cases the engine had already been working hard for several hours. The Paris-Abbeville runs had occupied respectively 119 min. 10 sec. (with a signal stop and other delays), 109 min. 12 sec., and 107 min. 34 sec. for the 109¼ miles. Owing to the fact that at Caffiers summit the gradient changes in about half a mile from 1 in 125 up to 1 in 125 down, the water level in the boiler cannot be allowed to sink very much so that little assistance can be secured in this way. I was not on the footplate of the 4-4-2 engine and so was not able to observe the way in which the boiler met the demand for steam, but in the cases of both 4-6-2 engines the steam pressure was easily maintained just below the blowing-off point.

With the same steam pressure and driving wheels of the same diameter, the 4-4-2 engines have high-pressure cylinders, 13⅜ × 25¼, and low-pressure cylinders, 22 × 25¼; the 4-6-2 engines have high-pressure cylinders of diameter variously given as 16⅛ in. and 16½ in., with a stroke of 26 in.; the low-pressure cylinders of the 4-6-2 engines are 23½ in. by 26 in.

The performance of the 4-4-2 engine (done in the ordinary process of making up time without the driver having received any special instructions), was an extraordinary one. On looking through some of the published records of the late Mr. Charles Rous-Marten, I have, however, found a few performances by Nord engines of approximately the same merit.

The 4-6-2 engines (cases B and C) had their regulators wide open and steam cut off at almost the latest possible points in both sets of cylinders, but no high-pressure steam was admitted direct to the low-pressure valve-chests. In view of the small size of the high-pressure cylinders of the 4-4-2 engine, it seems probable that in case A some steam was admitted direct to the low-pressure valve-chests.

On one occasion another of the 4-6-2 engines, with 321 tons behind the tender, the gross load amounting approximately to 445 tons, developed, again by calculation, as much as 2,350 horse-power. This time the calculation is not so convincing as in the case of the work up the Caffiers bank, because the gradient was not nearly so steep and the proportion of the resistance due to gravity to the total resistance much lower. Still, it is quite likely that the calculated effort was really developed because this particular engine had been fitted with enlarged steam pipes which may have enabled her to use more steam than the others.

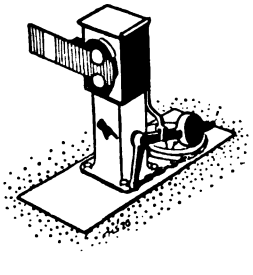
This performance took place just before the Gannes summit was reached on a run from Amiens to Paris. The times of passing the kilometre posts were (from Amiens) :—

	Min.	Sec.
Post 91	26	32
„ 90	27	3
„ 89	27	35
„ 88	28	7
„ 87	28	39

The average speed for four kilometres was thus exactly 70 miles an hour, and hardly varied all the way. The line ascends 15 metres in these four kilometres.

In this case the horse-power per ton of engine works out at about 28.

The horse-powers given are all British horse-powers. A metric horse-power is slightly less than a British horse-power, so that the results, if expressed in metric horse-power, would be slightly higher.



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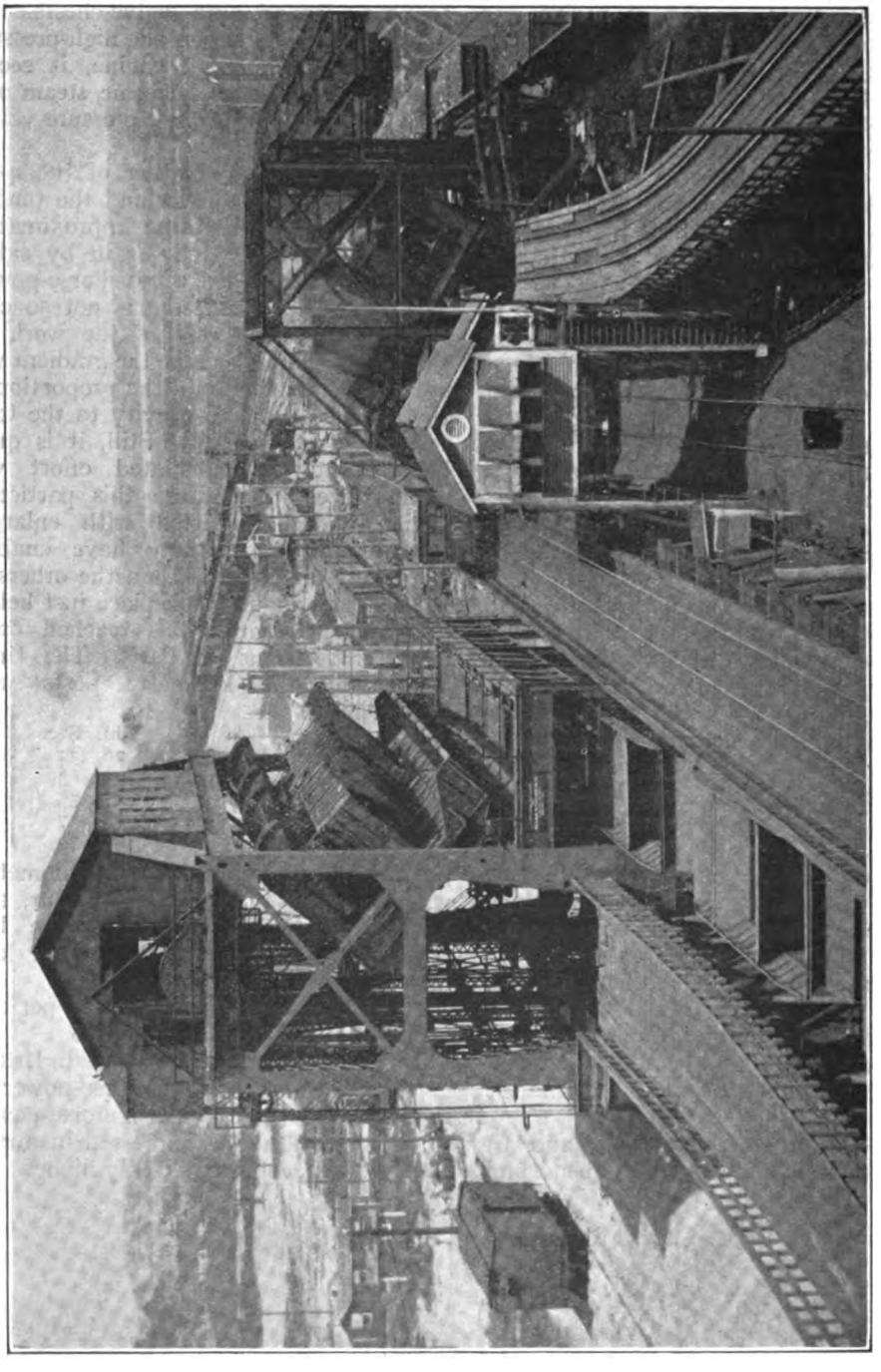

GENERAL VIEW OF VIRGINIAN RAILWAY COAL-HANDLING PLANT. SINGLE CAR TIP ON RIGHT AND DOUBLE CAR TIP ON LEFT.

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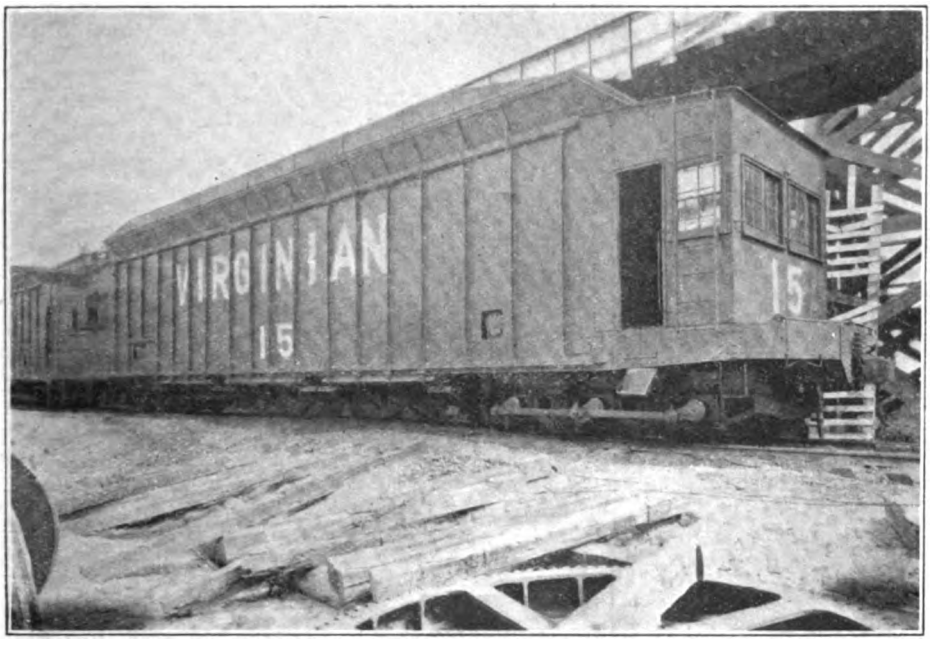
Coal-Handling Plant, Virginian Railway.

THE coaling plant of the Virginian Railway Company at Sewall's Point, near Norfolk, Virginia, is probably one of the largest in the world, and was erected in 1909. It deals with 4,000,000 tons a year. Although so recently installed, it has already been extended and improved upon by the provision of a new coal-tipping apparatus, which has increased the capacity of the plant from 1,500 to 3,000 tons per hour.



ELECTRICALLY-OPERATED TRANSFER CAR.

The main feature of the additional equipment is that it will tip two of the high-capacity coal cars used on American railroads. These cars carry 60 tons of 2,000lb. each, but the Virginian Railway has recently introduced some cars of 110 tons capacity, weighing, when loaded, 160 tons, and this has been a factor in the provision of the present plant; only one such car can, however, be tipped.

There is one remarkable feature about the Virginian Railway which, we believe, makes it unique. Whilst it handles a very big mineral traffic none of the wagons are constructed suitably for tipping. This was done with the idea that all wagons bringing coal for shipment would be available for a return load of any class of commodity. The coal wagon is, therefore, put into a cradle, turned, and the contents tipped into a transfer car which itself has the customary bottom doors for dropping the coal into pockets on the pier. The transfer cars are self-propelling, and electrically-operated by overhead wire and of 120 tons capacity, some recent cars carrying 150 tons.

The new coal tip is 91 ft. 8 in. clear between the end posts. It has two platforms, one for each car, resting on rollers in the bottom of the cradle. When the cars are on the platforms they move laterally as far as is required—one platform may have to move further than the other should one car be wider than its fellow—in order to press the cars accurately against the side of the cradle. There are eight clamps, automatically adjusted, which descend on the top of the cars and

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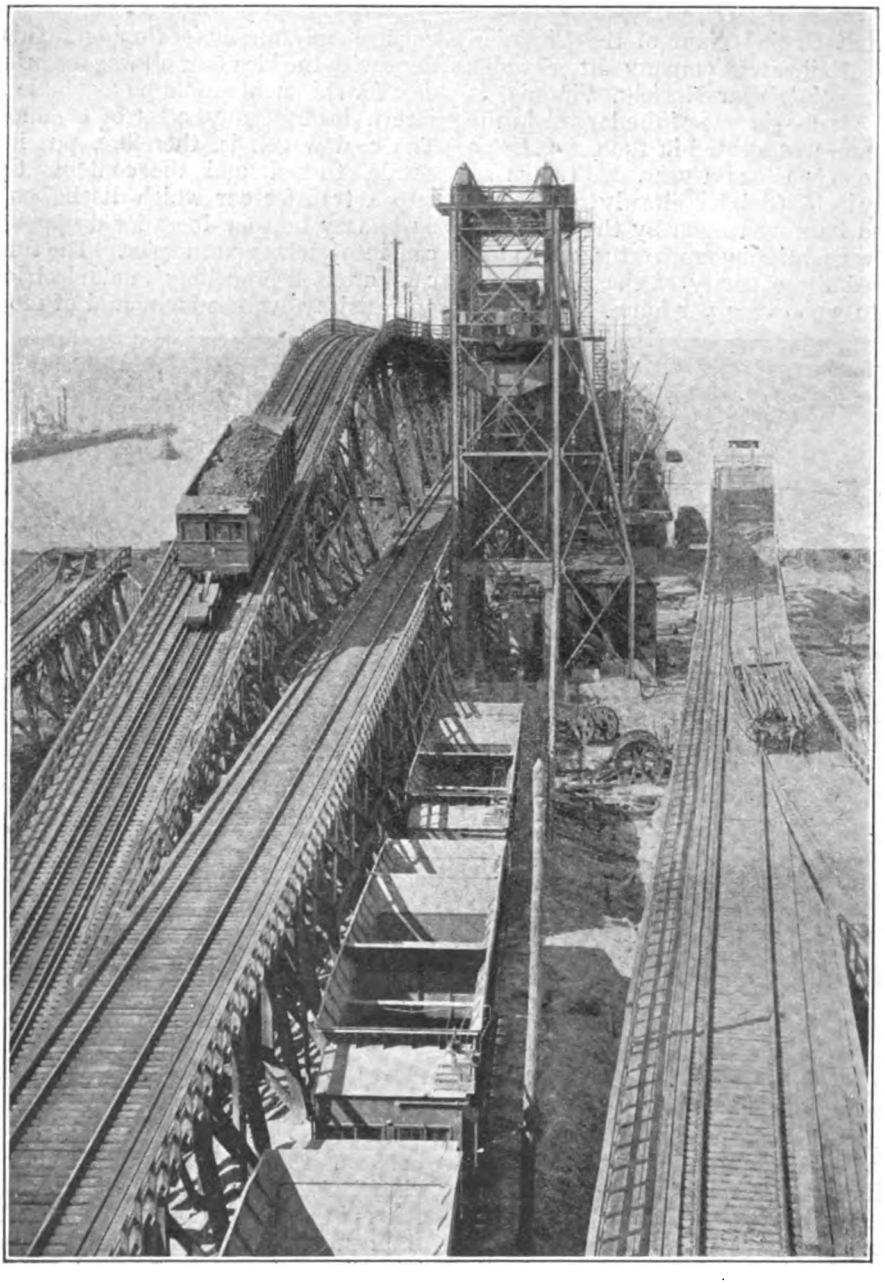

RAISING CARS TO PIER LEVEL—ON THE LEFT BY CABLE AND IN THE FOREGROUND BY HOIST.

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hold them whilst being turned. The cradle is turned until the cars are inverted to an angle of 20 deg. with the vertical. The cradle and clamps are counterweighted so as to assist in their return to normal. The mechanism is situated on the top of the main structure, so as to be remote from the coal dust and accessible for repairs. A complete system of stairs and platforms gives access to all machinery.

Coal dumped from two cars end to end is distributed over a distance of 88 ft., but as the transfer car has a hopper of 51 ft. only, two steel apron conveyors are provided, each about 8 ft. wide and 24 ft. long, supported horizontally in front of the car dumper on to which the coal is tipped from the cars and carried horizontally and discharged into the transfer car. The conveyors and cradle are interlocked so that the former are in operation when the cradle is turned. The transfer cars are mounted on two six-wheeled bogies at 50 ft. centres, each provided with a traction type driving motor of 60 h.p. capacity provided with series-paralleled control and geared for a speed of 12 m.p.h. The length over the buffers is 70 ft., the height 16 ft., and the width 12 ft. There are three compartments, each having a capacity of 40 tons, and provided with a double system of discharge gates at the bottom. The gates are separately operated by an air cylinder situated in the end of the car to provide two openings 9 ft. long by 3ft. 8 in. wide.

One illustration shows the original coal tip on the right and the new type on the left. This is taken from the pier direction and looking landwards. Another illustration is taken from the tips looking towards the sea, on the left hand of which will be seen the earlier method of taking the transfer car by cable from the tip to the pier where the coal pockets are situated. For the new tip there is a hoist, seen in the foreground. This gives a lift of 65 ft. by an electrically-operated rope system.

The present and former work was carried out under the supervision of Mr. H. Fernstrom, Chief Engineer to the Virginian Railway, by the Wellman-Seaver-Morgan Company of Cleveland, and we are indebted to the Wellman-Smith-Owen Engineering Corporation, Limited, of King's House, Kingsway, W.C.2, the sole representatives for the system in this country, for the photographs from which our illustrations have been prepared.

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IN this volume are given the recollections and experiences of a man who began his railway career as a junior clerk more than half a century ago; was afterwards in the service of various railways, great and small, in England, Scotland and Ireland; attained at a comparatively early age to the position of general manager; is now a railway director; has, in his time, mingled much with railway men from the highest to the lowest; has seen and heard much and had much to do in connection with railway promotion, construction and working, and with railway matters generally. A pleasant thread of personal narrative runs through his pages, the author has imparted an amount of practical information which should be helpful to the younger members of the railway service. Everyone interested in railway working should possess a copy.

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NEW ZEALAND GOVERNMENT RAILWAYS:

ROYAL ENGINE AND TRAIN.

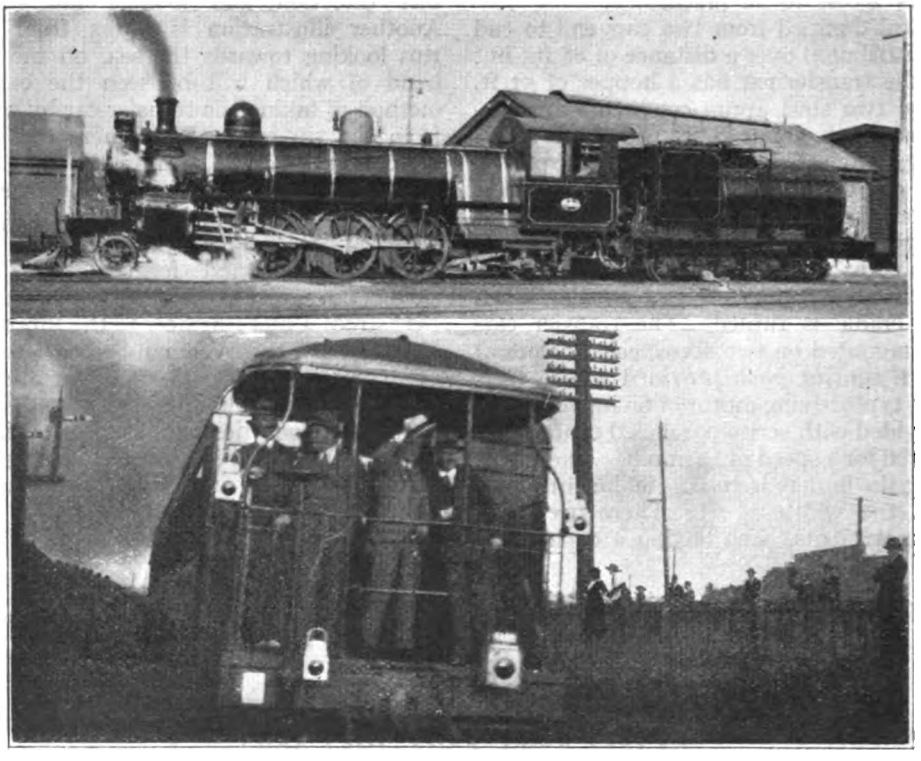

Photo.] [*W. W. Stewart.*

ROYAL TRAIN LEAVING AUCKLAND FOR WELLINGTON.

H.R.H. Prince of Wales standing on the platform of the Royal Car.
Locomotive, Class AB, No. 663, built at Addington Workshops, 1917,
designed by Mr. H. H. Jackson.

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British Locomotive Practice and Performance.

By CECIL J ALLEN.
A.M.Inst. T.

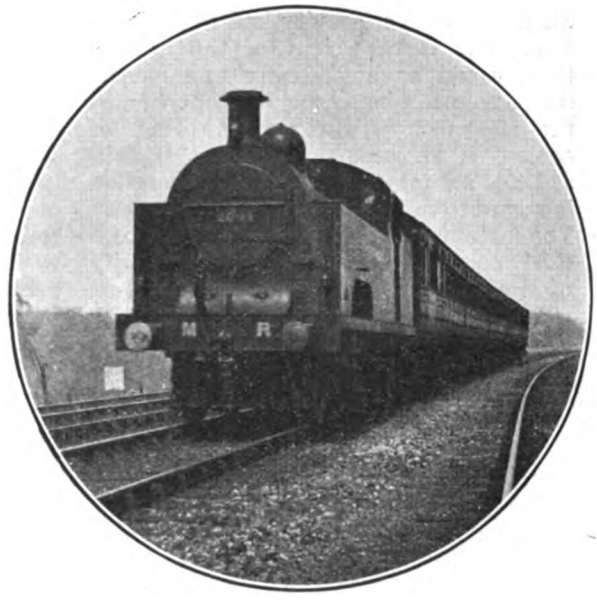

Photo.] MIDLAND RAILWAY. [*W. Leslie Good.*

Birmingham suburban train passing Northfield.
0-6-4 tank engine, No. 2031.

IN the May number I had occasion to direct some rather strong criticisms to the letter of a friend who had been arguing the non-essentiality of accurate load estimation when one is recording locomotive performance. Prior to his recent departure for South Africa, my correspondent indited a further interesting epistle in which he expounds at some length—although in my opinion he fails to justify—his attitude in this matter. "In the first place," he writes, "timing may be divided between the locomotive and the traffic point of view. From the latter the times are the chief thing; what the traffic people require to know is whether the locomotives are capable of keeping or improving on time, and to what extent, with a normal but not necessarily constant load. It might be argued that precise accuracy in timing is not essential, and it probably is not; also that continued neglect of loading conditions leads to such absurdities as the pre-war 23-minute booking from King's Cross to Hatfield; also that accuracy with regard to load limitations for different classes of locomotives makes fast bookings more practicable, as on the Midland Railway in pre-war days. All these arguments have their value; but the fact remains that from the traffic point of view there is more need for accurate observation of times than of loads, provided that the loads are normal. That is to say, an occasional extra coach may be added without making the load abnormal. With an abnormal load, which requires the engine to be 'extended' for considerable distances, there is much more importance in accurate estimation.

"Now for the locomotive point of view. Here, of course, the load and speed are equally important, as well as the gradients, weather and other factors; but to get a true estimate of locomotive efficiency we require details of coal and water consumption, and even of frequency of repairs. Moreover, besides the varying resistance of different types of rolling-stock, the proportion of variation also varies on different stretches of line. This is so involved a statement that an illustration is necessary. Take two trains—one of 36 axles of old 6-wheel stock weighing about 15 tons each (total, 180 tons), the other of 28 axles of modern bogie stock weighing 30 tons each (total, 210 tons). On a curving level stretch of line the lighter train would probably give the greater resistance, but

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when the force of gravity had to be overcome, the extra weight of the heavier train would assume greater prominence, the prominence increasing in proportion to the steepness of the incline. This, of course, is an argument against myself, as loads are taken most into consideration in regard to the work on ascending grades." The last-mentioned point is one comparatively easy of answer. In the vast majority of the timed runs which figure in these columns—in fact, I might almost say exclusively, save for the very occasional inclusion of odd 6-wheeled vehicles in modern express train formations—"modern bogie stock" only is employed. It would be sufficient, indeed, to say "bogie stock," seeing that the comparison at issue is between the relative resistance of 6-wheeled and bogie vehicles respectively. Varying resistance in the matter of the vehicles composing the trains timed in connection with these articles may therefore be treated as negligible, for all practical purposes.

It is not difficult, also, to answer the main contentions of my friend's letter as to the traffic and locomotive aspects of locomotive performance. Officials concerned with traffic operation may, and doubtless do, pay more attention to times than to loads; but one cannot avoid the opinion that this view of locomotive work is materially at fault on account of its one-sidedness. Only one company—the Midland—has seriously tackled the problem of correlating locomotive tractive power, trainloads and intermediate grading in working out the running times of its expresses, and the resultant effect on the punctuality of the main line train services of that company has always been particularly marked. As regards these articles, however, the issue is a perfectly clear one. They do not claim to be traffic articles at all, although it is impossible to write on such a subject without touching freely on traffic questions in relation to locomotive work; on the contrary, they are intended to deal, as their title indicates, with locomotive constructional practice, on the one hand, and locomotive performance, on the other. As regards the latter, I agree with my friend's contention that a complete record of locomotive work should include details of fuel and water consumption, maintenance costs, etc., but it must be obvious that the acquisition of such infor-

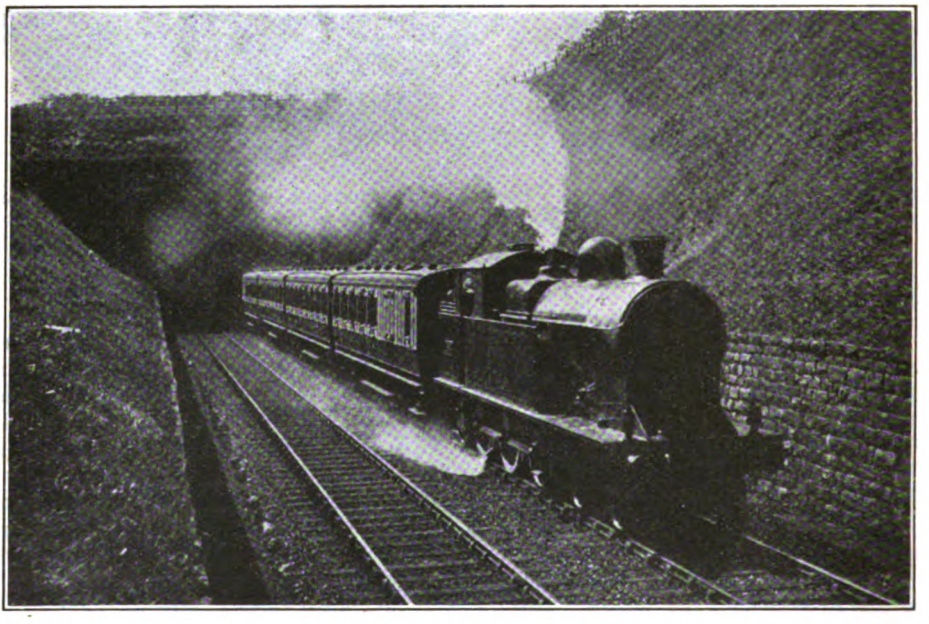

Photo.] LONDON & NORTH WESTERN RAILWAY. [*R. J. Osborne.*

Birmingham–Rugby fast train leaving Beechwood Tunnel. 4-6-2 tank engine, No. 632.

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mation for publicity purposes is practically impossible, except in cases where the locomotive authorities of a railway have had special trials made, and have published the results. At the same time there is an extensive field of study in the actual running performance of different types of locomotives under different conditions, and in order that this may properly be appraised, accurate attention to detail is just as necessary in the matter of loads as in that of times. In fact, I think it will be generally agreed that accuracy of observation in *all* technical matters without

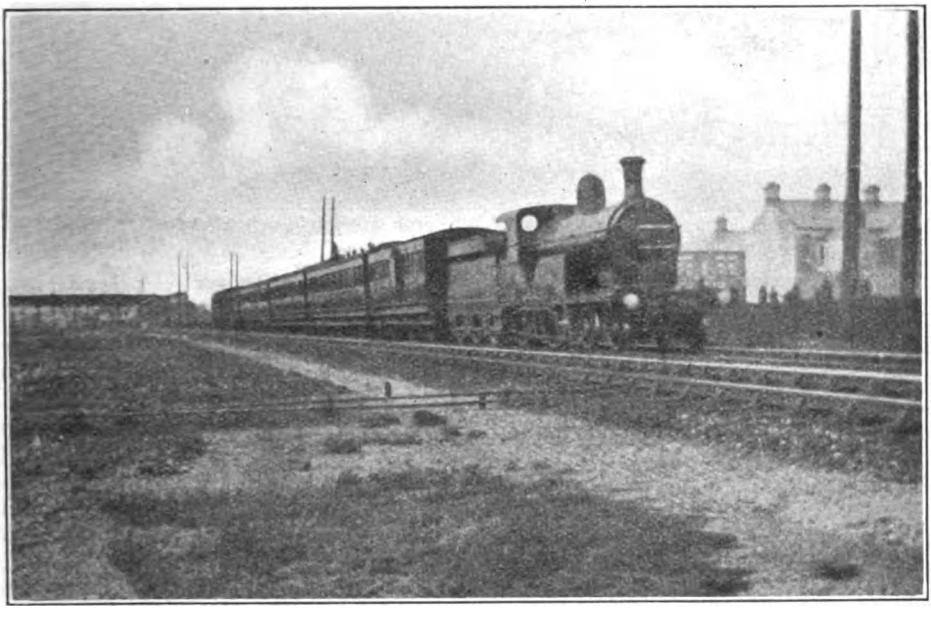

Photo.] GREAT NORTHERN RAILWAY (IRELAND). [*W. P. Sefton.*

Special train conveying the Commander-in-Chief, near Adelaide (Belfast).
4-4-0 locomotive. No. 82.

exception is vital, if the observations in question are to have any ultimate value.

My correspondent adds (in reference to his method of estimating Great Western loads, as to which I had something to say in the article referred to): "I think I have generally classified bogie coaches on the Great Western Railway as 'elliptical,' 'clerestory' and 'flat-roof'; also I have mentioned 'diners,' if any. These are rough classifications, but I should put the *average* weights respectively at 32, 27 and 20 tons." Like many other of my readers, the writer has evidently not learned to distinguish between elliptical *seventy*-feet and elliptical *sixty*-feet coaches on the Great Western Railway, although the distinction in length should be apparent on the most casual external scrutiny. I should put the average tare weight of the former at 33 tons and of the latter at 27 tons. Corridor clerestory 8-wheelers on the Great Western Railway certainly do not average 27 tons each; I should have given the figure as 25 tons, at the very most, and of non-corridor "clerestories" at not more than 22 or 23 tons. I trust that the foregoing remarks as to distinguishing between the two classes of Great Western elliptical bogie stock will be read, marked, learned and inwardly digested by those who forward Great Western Railway logs to me in future, and are not yet familiar with the differences referred to.

The foregoing remarks as to the scope of these articles lead me to refer briefly to a letter from another correspondent, in Yorkshire, who asks particularly that I should "visit the North sometime in the future," with a view to timing certain trains over two important main lines which pass through his immediate neighbourhood. In point of fact, I spend more time in the North of England than in the

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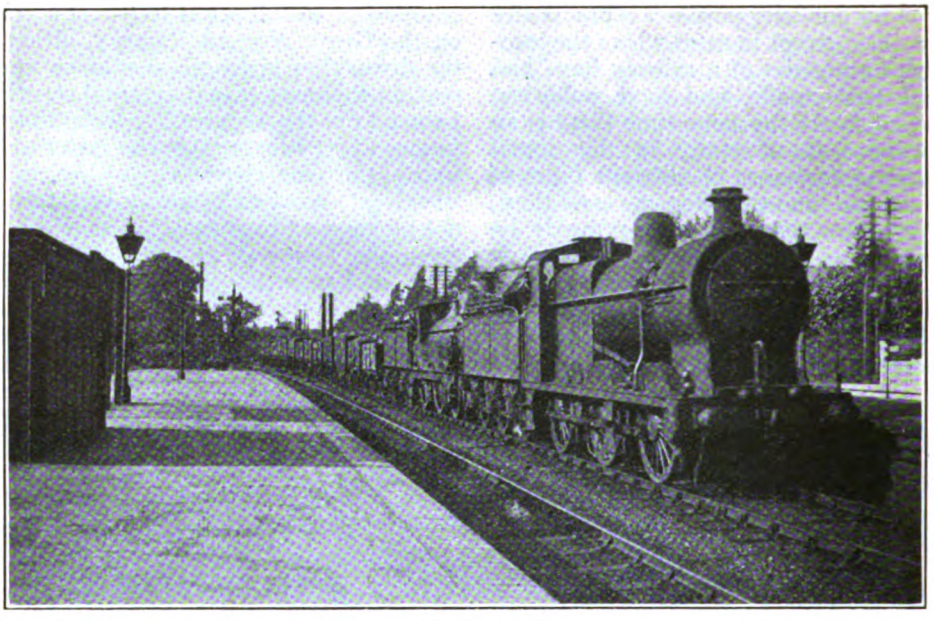

Photo.] MIDLAND RAILWAY. [*F. H. Stingemore.*

Up coal train passing Harpenden. Superheater 0-6-0 engine, No. 3864 piloting 2-4-0 engine No. 212.

South, and as for the two routes concerned, I travel over them comparatively frequently. Both routes have in the past figured in these articles, but the reason I seldom now deal with them is that, with all allowance for exceedingly heavy grades, the present timings are so slack, generally speaking, as to offer little in the way of an indication of the tractive capacity of the locomotives working over them. Much more notable performance, in the case of both the companies concerned, can be observed on other sections of their main lines, and in view of the inevitable limitations of space in these columns, the latter have the preference as being of the greater general interest. That is to say, I endeavour to adopt the locomotive, rather than the traffic point of view, in all the runs here described.

Since I wrote last month's article, several of the summer time-tables have appeared, although they contain little that is of interest. It is rather depressing to note that the South Eastern and Chatham Company, whose splendid programme of June, 1919, embodied a complete return to pre-war, and even better than pre-war main-line train services, is compelled to "ease" still further the times of many of the most important trains. There is no longer a 90-minute service in either direction between London and Margate, the 3.15 p.m. *ex*-Victoria now having 92 minutes, and the 9.30 a.m. into Cannon Street 94 minutes. Beyond these trains the best times are those of the 1.10 p.m. *ex*-Victoria on Saturdays (95 minutes), the 9 and 10.45 a.m. (Sundays) *ex*-Victoria (96 minutes), and the 5.5 p.m. from Holborn Viaduct (97 minutes), while the 10.15 a.m. out of Victoria on Sundays runs to Westgate in the even 1½ hours. The 8.57 a.m. from Margate runs to Victoria in 97 minutes, and the 6.17 p.m. on Sundays in 99 minutes, but all other trains, up or down, take 100 minutes or over. There is still the smart schedule of the 10.45 a.m. *ex*-Victoria on the Kent Coast line (22 miles from Faversham to Margate, start-to-stop, in 25 minutes; average, 52.8 m.p.h.), and the 59-minute allowance of the 6.15 p.m. from Cannon Street to Chatham is not to be despised, but these are exceptions to the general run of material slowings. The same feature is also apparent on the Folkestone line, such times as 88 and 92 minutes to Sandling by the 10 and 11 a.m. trains *ex*-Charing Cross, and of 92 minutes to Folkestone by the 1.32 p.m. from the same terminus, being below the figures of last summer; the 100-minute allowance of

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the new 5.10 p.m. from Cannon Street to Folkestone is a misleading figure, however, as it runs as far as Tonbridge attached to the 5.10 p.m. to Hastings, the combined train stopping on the through road at Tonbridge for purposes of division. The 5.5 p.m. to Hastings (previously non-stop) now calls at Tunbridge Wells, and the load of the 5.10 to Hastings is thereby reduced. There are still left two down and three up expresses between Charing Cross and Folkestone on the 90-minute schedule, and the 47-minute allowance of the 9.30 p.m. *ex*-Charing Cross between Tonbridge and Shorncliffe (39¾ miles = 50.8 m.p.h.) is also retained.

North British summer time-tables witness the reinstatement of the season expresses from Glasgow to the East Coast, both the Lothian Coast and the Fifeshire Coast Expresses being this year provided with restaurant cars. The omission of Edinburgh in the case of the former is not perpetuated, and the old 60-minute run in each direction between Edinburgh and Glasgow makes a total of five expresses now working on that schedule, including a new westbound train at 7.15 p.m. *ex*-Waverley. In Ireland the Great Southern and Western summer programme has also come into force, the 11 a.m. luncheon car express from Dublin to Cork being reinstated, with its corresponding return train at 4.30 p.m.; there is still an allowance of 110 minutes from Kingsbridge to Thurles (86¾ miles) on the down journey, but the Charleville stop is this year omitted, and the times beyond Thurles are thereby eased. The afternoon express from Dublin to Cork is also expedited, and has a 70-minute non-stop run to Maryborough. *Apropos* of the June time-tables, I wonder how many readers noticed the extraordinary note which appeared in the June "Bradshaw" on pages 281A and 281B (Great Northern Main Line). Alongside the 1.15 p.m. "semi-fast" from Leeds to King's Cross, due in London at 6.20 p.m., was found this legend: "Will convey through dining cars from Leeds to King's Cross, which will be t ansferred to the duplicate portion of the 1.53 afternoon express from Doncaster, and be due to arrive King's Cross at 5.40 afternoon." The 1.53 p.m. from Doncaster is, of course, the up Harrogate express, but there was no sign of the said "duplicate portion" in the tables, nor indication as to where it stops. Doubtless the summer time-tables will make the matter clear, but for a public time-book the note I have quoted seems to me unique. This acceleration of the 1.15 p.m. *ex*-Leeds to a 4 hours 25 minutes time to London, by the way, appears to foreshadow the return to the time-tables of a train resembling the old "crack" 2 p.m. up, although it is very unlikely that non-stop running will ever be resumed from Wakefield.

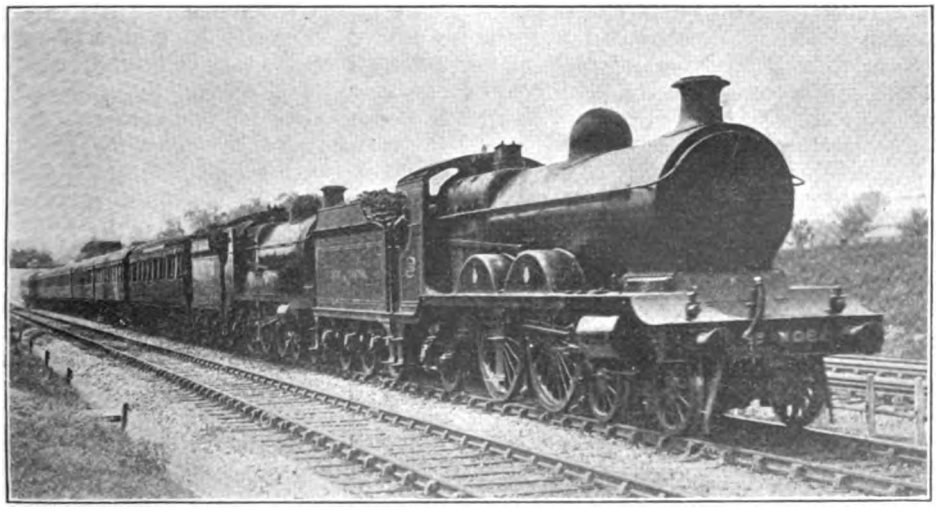

Photo.] **GREAT CENTRAL RAILWAY.** [*F. E. Mackay*

Up Bradford–London express. 4-4-2 Engines No. 1088 and No. 192.

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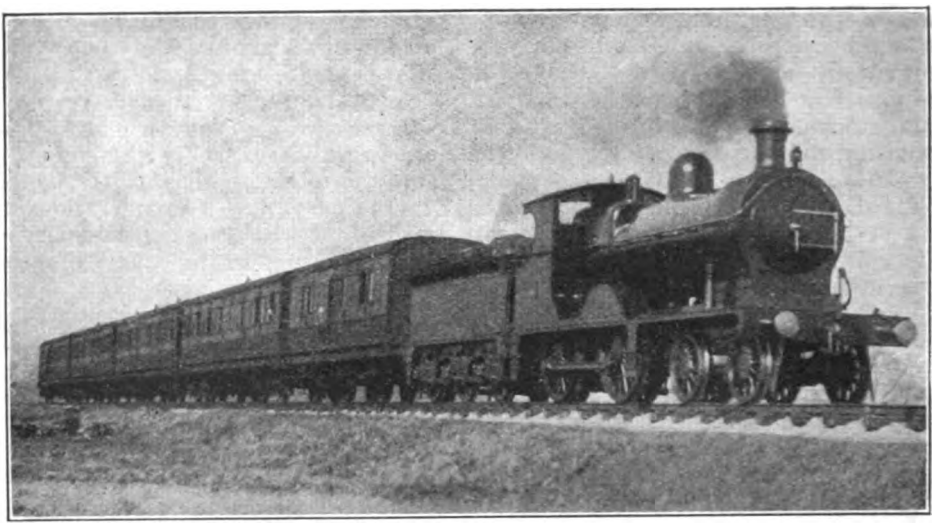

Photo.] MIDLAND AND SOUTH WESTERN JUNCTION RAILWAY. [*W. Rich.*

Cheltenham–Andover fast train on single line near Cirencester. 4-4-0 locomotive, No. 8.

The recent accelerations effected by the Great Northern Railway of Ireland fired me with such a desire further to sample the running on that system that, by dint of two successive night journeys and with the help of facilities kindly granted for the purpose by Mr. J. Bagwell, the General Manager, I managed recently to squeeze in a trip from Belfast to Dublin and back. It was the 3 p.m. express from Dublin to Belfast that constituted the chief attraction, with its overall time of 2½ hours and a substantial load; in the opposite direction the train I patronised was the 7.30 a.m. from Belfast, making nine intermediate stops, but still completing the journey in three hours, by reason of smart intermediate timings. Both trains I found were hauled by the same engine—the pioneer superheater 4-4-0 No. 174, *Carrantuohill*—and the exacting work entailed by the time-table appeared to be performed with the greatest of ease. Gradients on this route were detailed at considerable length in the September issue of 1919, when last I dealt with the running over it, and need not, therefore, be recapitulated.

On the 7.30 a.m. *ex*-Belfast we carried a load of eight corridor 8-wheelers, including restaurant car—226 tons empty and 240 tons full—as far as Goraghwood, and one less—201 tons empty and rather over 210 tons full—from there to Dublin. The timing of this train is curiously unequal, the allowance of 13 minutes for the initial 7½ miles to Lisburn being easy in comparison, say, with 7 minutes only for the 5 miles from Lurgan to Portadown, in both cases start-to-stop, even after making all allowances for a rising grade in the former instance, and a falling one in the latter. Strangely enough, however, we lost 40 seconds on the first stage, although we covered the 12½ miles from Lisburn to Lurgan in 16½ minutes, start-to-stop, attaining 60 m.p.h. on the easy grades beyond Maze, and only falling to 50 on the final 2-mile rise (mostly at 1 in 145–155) to mile-post 96. Owing principally to an excessively slow stop at Portadown (very slow stops are common to this railway, but the driver of *Carrantuohill* seemed to specialize in this direction), the 5 miles on to Portadown occupied 8 minutes 10 seconds, but in view of slight cutting of the stopping times at Lisburn and Lurgan, and to the ½-min. gained between the two last-mentioned places, we were less than a minute late at Portadown. From the latter town we covered the undulating 8 miles to Scarva in 11 minutes 35 seconds, and the 7¾ miles on to Goraghwood occupied 11 minutes 25 seconds, in both cases start-to-stop; the schedules are 11 minutes in both instances.

Up to this point there had been slight losses of time on most sections, but this appeared to be due to the fact that the

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margins allowed at stations are more than ample, and the driver therefore was not hurrying. But after Goraghwood we had a real sample of *Carrantuohill's* capabilities. With the reduced load of 210 tons, we first ran the 2½ miles up to Bessbrook, beginning at 1 in 139 and finishing at 1 in 113, in 6¼ minutes, start-to-stop, and then accelerated up the continuous 1 in 112–100 from the second stop to a speed of 34½ m.p.h., passing the summit (mile-post 65½), 3¾ miles, in 8¼ minutes from the Bessbrook start. So the 6¾ miles from Bessbrook to Adavoyle were run in 12¼ minutes, instead of the 15 minutes allowed, this gain, added to the ¾-minute gained on the preceding section, making a total of 3 minutes in favour of the engine from Goraghwood alone—the hardest stretch of the whole journey. After this comes the fastest booking on the Great Northern Railway, the 8¼ miles down to Dundalk being allowed only 9 minutes, but owing again to a terribly slow stop at the latter place we took 10 minutes 10 seconds. But we reached a top speed of as much as 77½ m.p.h. on the descent. From Dundalk we passed mile-post 52, 2¼ miles' ascent, in 4¼ minutes, at 37½ m.p.h., Dromin Junction, 10¾ miles, in 13 minutes 25 seconds, after a maximum of 60 m.p.h., and mile-post 37½, 17 miles, in 21 minutes 25 seconds, the minimum rate on the 5½ miles of Dunleer bank being exactly 40 m.p.h. From the summit we ran very slowly down to Drogheda, the 22½ miles from Dundalk taking 28 minutes 35 seconds (schedule 29 minutes), whereas we could easily have completed the distance in 27½ minutes. From Drogheda to Dublin there is an easy booking of 40 minutes, on which we gained ½-minute, even though we started very slowly, passing Balbriggan, 10 miles, in 14¾ minutes, mile-post 16, 15¾ miles, in 21 minutes 40 seconds, and Malahide, 22¾ miles, in 29 minutes 5 seconds. Speed fell to 43½ m.p.h. at mile-post 16, and 54 at Raheny, with an intervening maximum of 66 beyond Rush and Lusk. The feature of this last run, of course, was the smart finish of 17 minutes 50 seconds from mile-post 16 into Dublin.

On the return journey by the 3 p.m. express, the work performed was consistently fine throughout. We left Dublin with a 9-coach corridor express

Photo.] MIDLAND RAILWAY. [*F. W. Goslin.*

Down Leeds express near Bedford. 4-4-0 compound locomotive, No. 1025.

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weighing empty 288 tons, and with passengers at least 305 tons, if not more, as the train was very well filled. Raheny, 3¾ miles, was passed in 7 minutes 40 seconds; Malahide, 9 miles, in 13 minutes 10 seconds, at 64½ m.p.h.; mile-post 16 in 21 minutes 5 seconds, at 43½ m.p.h.; Balbriggan, 21¾ miles, in 27 minutes 20 seconds, at 61 m.p.h.; and Laytown, 27 miles, in 32 minutes 40 seconds. There was a very long and careful slack as we approached Drogheda, which was passed at 30 m.p.h., the 31¾ miles from Dublin having occupied 38 minutes 5 seconds. Here we slipped a coach, the gross weight of the train being reduced to 275 tons. On the 1 in 167–177 up to mile-post 37½ we accelerated to and maintained a speed of 43 m.p.h.—a fine feat with this load—so breasting the summit in 46 minutes 5 seconds from the start. Full use was then made of Dunleer bank, speed rising to a sustained 74 m.p.h.; Dromin Junction, 43½ miles, was passed in 52 minutes 10 seconds; mile-post 52 in 59 minutes 50 seconds; and 52½ miles were covered in 5 seconds over the first hour out of Dublin. The usual type of stop was then made at Dundalk, whereby we lost a full half-minute, but even so we had completed the 54½ miles in 63½ minutes, ½-minute under schedule. Notable times on this run were 23 minutes 40 seconds for the 22½ miles from Howth Junction to Laytown, and 13¾ minutes for the 14¾ miles between mile-posts 37½ and 52. A time of 25 minutes 25 seconds with 275 tons for the 22½ miles from Drogheda to Dundalk was also excellent, as it would be equivalent to less than 27 minutes from a standing start at the former place.

At Dundalk we lost another coach—for Omagh *via* Enniskillen—and so tackled Adavoyle bank wi h a reduced load of 240 tons. Mount Pleasant, 3¾ miles, was passed in 7 minutes 40 seconds, and mile-post 59½, at the end of the 2¾ miles at 1 in 100, at 29 m.p.h.; on the slightly easier part of the ascent we rose to 34 m.p.h., passing Adavoyle, 8¼ miles, in 16 minutes 10 seconds; the subsequent half-mile down at 1 in 140 produced a maximum of 49 m.p.h., and we did not then go below 41½ on the last 2¼ miles to the summit, mostly at 1 in 120. So mile-post 65½, 11¼ miles from Dundalk, was passed in 20 minutes 20 seconds. After this we went very easily, having time well in hand; no speed higher than 62½ m.p.h. was touched before Bessbrook, nor more than 67 subsequently. So Goraghwood, where we slipped two more coaches (for Warrenpoint) and so reduced our load to 170 tons, was passed in 26 minutes 40 seconds (17½ miles); the 7¾ miles on to Scarva occupied 9 minutes, including a bad p.w.r. check at Poyntzpass and the usual Scarva slack, and the 8 miles thence to Portadown 9 minutes 55 sec.—total, 45 minutes 35 seconds for the 33¼ miles from Dundalk, or 44 minutes net. This train is allowed 46 minutes, but had the running not been so materially eased after Adavoyle summit, we could easily have bettered the "Limited Mail" time of 43 minutes. More marshalling took place at Portadown, a coach for Londonderry being detached and four from that city attached, making us up again to an eight-coach train of 260 tons. Is it not a record, by the way, for an express to work no less than *six* distinct portions in a journey of only 112½ miles, not to mention carrying sections both from and to the same destinations? So far as Omagh is concerned, indeed, two coaches run to it by different routes on the same train, and a portion from the same place also is attached—an extraordinary complication of affairs. Brilliant running was made from Portadown, Lurgan, 5 miles, being passed in 8 minutes, and mile-post 96, 8½ miles, in 11 minutes 50 seconds, despite the fact that practically the whole distance is on rising grades, largely steeper than 1 in 300. At the summit we were doing 51½ m.p.h. After this, we touched 66 m.p.h., and then ran very easily into Belfast, passing Moira, 10½ miles, in 13 minutes 55 seconds; Lisburn, 17½ miles, in 20 minutes 35 seconds; and Balmoral, 22¾ miles, in 25 minutes 50 seconds; crawling in to the stop at Great Victoria Street we completed the 25 miles in 29 minutes 40 seconds. The excellent running on this journey still further enhanced my already high opinion of Mr. Glover's fine 4-4-0 superheater locomotives.

Before leaving this railway, I will mention briefly a couple of runs very carefully timed by a correspondent on the "Limited Mail" expresses. On the 7.25 a.m. *ex*-Dublin No. 172, *Slieve Donard*, had a load of 6 coaches only, weighing 181 tons empty and 190 tons full. Malahide was passed in

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13 minutes 10 seconds, Balbriggan in 26 minutes 55 seconds, and Drogheda was reached in 37 minutes 33 seconds. From there mile-post 38, 6¼ miles, was breasted in 10 minutes 43 seconds (why does not my friend time to the summit at 37¼ miles?), Dromin Junction in 16 minutes 20 seconds, at 71 m.p.h., and Dundalk was reached in 27 minutes 10 seconds. From Dundalk the climb to mile-post 65¼ was achieved in 19 minutes 25 seconds, speed averaging 33 m.p.h. up the worst part of the incline; Goraghwood was passed in 25¼ minutes, Scarva in 33 minutes 25 seconds, and Portvehicles); Scarva was passed in 10 minutes 37 seconds, and Goraghwood in 18 minutes 40 seconds, the 6¼ miles thence up to the summit being run in 10 minutes 35 seconds, with a minimum speed of 28 m.p.h. The slacks at Scarva and Poyntzpass were slight, and the climbing fell considerably short of my record behind *Carrantuohill*. But a very rapid descent was made to Dundalk, with a top speed of slightly over 78 m.p.h., the 33¼ miles from Portadown being completed in 40¾ minutes, or 2¼ minutes under schedule. The only loss of time was between Dundalk and Drogheda,

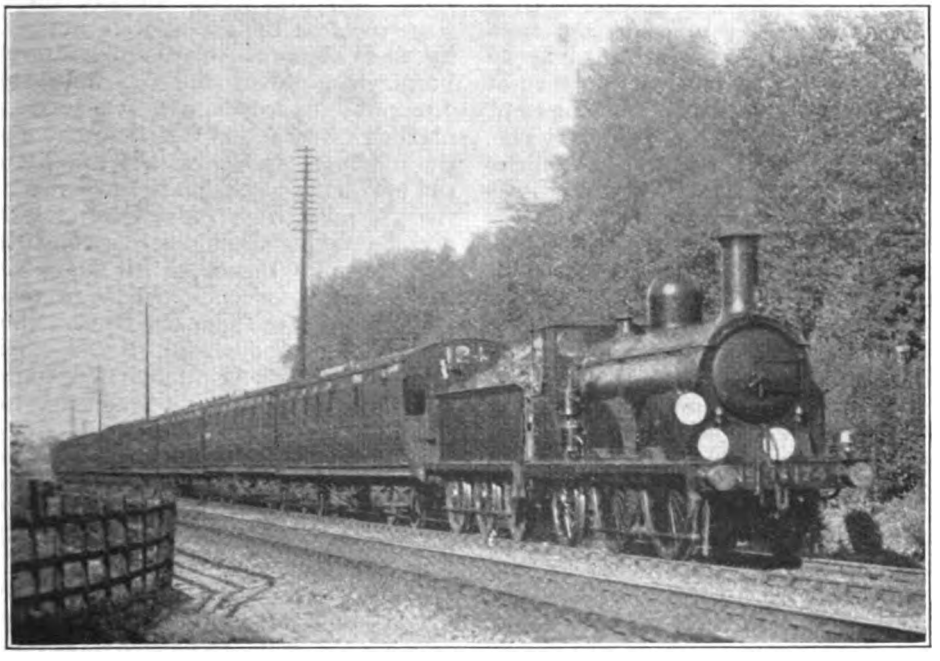

Photo.] LONDON, BRIGHTON & SOUTH COAST RAILWAY. [*C. Laundy.*

London Bridge–Eastbourne and Hastings train. 0-4-2 engine, No. 174.

adown reached in 42¼ minutes. Most of these were better times than mine, but the load was much lighter.

With the up mail, at 4.25 p.m. out of Belfast, No. 173, *Galtee More*, performed some fine work. Starting with 190 tons, No. 173 passed Lisburn, 7½ miles, in 12 minutes 5 seconds, and despite a slack for p.w. repairs at mile-post 96, reached Portadown in 30 minutes 52 seconds, this time for the 25 miles being just inside schedule. Net time was 30 minutes, instead of the 31 minutes allowed. At Portadown the load was made up to 220 tons (seven bogie this length occupying 28 seconds over the 28 minutes allowed; Dromin Junction was passed in 14 minutes 20 seconds, and mile-post 37¼ in 22 minutes 22 seconds. But amends were made by a very fast run on the concluding section, the 31¾ miles from Drogheda into Dublin being run in 36 minutes 35 seconds, or 1½ minutes under schedule. The mile-a-minute rate was reached at Laytown, this first 4¾ miles taking 7 minutes 5 seconds; Balbriggan was passed in 12 minutes 22 seconds; mile-post 16 in 18 minutes 33 seconds; Malahide in 25 minutes 35 seconds, and Raheny,

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28 miles, in 31 minutes 20 seconds. So the engine could be credited with an aggregate gain of 4½ minutes on the journey.

Several readers have in letters to me expressed interest in the somewhat remarkable feat which Mr. Maunsell has achieved in rebuilding one of the Wainwright 4-4-0 engines with a superheater and materially increasing its tractive power without any addition to the engine weight. By the kindness of a Kent Coast reader, I am able to give some details of the work of one of these engines—No. 504, reconstructed by Messrs. Beyer, Peacock & Co., —on the 7.7 a.m. from Margate to Cannon Street. Since the run was timed, this train has been altered to run non-stop from Faversham, but previously called at all stations down to Whitstable, and then at Sittingbourne and Chatham. For the Kent Coast road the load was a very heavy one, consisting of no less than ten bogie vehicles with a total tare weight of 279 tons. As passengers were standing throughout the train beyond Chatham, the gross load cannot have been less than 305 or 310 tons on the final stage. Smart start-to-stop runs were made between the Kent Coast stations, the 1.6 miles from Margate to Westgate taking 3 minutes 50 seconds; the similar distance on to Birchington 4 minutes 50 seconds; the 8 miles thence to Herne Bay 11 minutes 10 seconds; and the 4.1 miles from Herne Bay to Whitstable 8 minutes. All these runs were well to schedule time. From Whitstable, No. 504 passed Faversham, 6.6 miles, in 11½ minutes, reducing speed very carefully for the curve; speed then rose to 60 m.p.h. on the short descent past Teynham, and Sittingbourne, 13.7 miles, was reached in 20 minutes 55 seconds. The allowance for this stretch was 22 minutes. A rate of 33 m.p.h. was maintained on the 1 in 110 rise to Rainham, and with a maximum of 56½ on the subsequent level stretch, Sittingbourne to Chatham, 10.6 miles, occupied 10½ minutes, start-to-stop, or half-minute over schedule.

The test of capacity was, of course, the ascent of Sole Street bank; from Chatham No. 504 passed Rochester Bridge, 1.4 miles, in 3 minutes 25 seconds, despite slipping badly at the start, and then ran the 6.1 miles up to Sole Street in 11 minutes 55 seconds. There are 5 miles continuously at the 1 in 100 inclination, save for two tiny level strips each less than ¼-mile long; the ascent was commenced at 33½ m.p.h., and speed varied between that figure and a final minimum of 27½ at the summit. This was really excellent work for a 52½-ton locomotive hauling a train nearly six times its own weight, and my correspondent adds a note to the effect that not only was the engine blowing off on breasting the summit of the incline, but also that the customary shower of sparks which fall upon the carriage roofs on the ascent were noticeable by their absence. From Sole Street to Farningham Road the 6.3 miles took 7 minutes 10 seconds, with two successive maxima of 69 m.p.h.; on Swanley Bank the minimum speed was 48½ m.p.h., and the maximum at St. Mary Cray was 56½, the 2·9 miles from Farningham Road to Swanley taking 5 minutes 10 seconds, and the 2.8 miles thence to St. Mary Cray 3 minutes 35 seconds. The 20 m.p.h. restriction for the spur line to Chislehurst was rigorously observed, the 2.5 miles between the two last-mentioned stations occupying 5 minutes 35 seconds; from there the 4.1 miles to Hither Green occupied 5½ minutes, but delays on the succeeding 5.9 miles to Cannon Street made the final stretch take no less than 12 minutes 20 seconds. Total time for the 32 miles from Chatham was thus 52· minutes 40 seconds, instead of the 50 minutes allowed, but net time was well on the right side of schedule. It would seem that these rebuilt 4-4-0's are thus likely to go a long way towards solving the Kent Coast problem for the South Eastern and Chatham Company; the large-boilered superheated 4-4-0's are too heavy for the Chatham main line, and, as my friend remarks, over a road of such terrible grading as this, the earlier Wainwright 4-4-0 engines are unequal to hauling 300-ton trainloads without loss of time, whereas the reconstructed engine appeared to have the mastery of its work.

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RAILWAY MAGAZINE readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o RAILWAY MAGAZINE, 30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book," for the current year. Price 5s. By post 5s. 9d.

Calling-on Distant Signals.

An apparent contradiction in terms, this is the best way of describing some unusual signals installed here and there on the North London Railway. We are indebted to Mr. G. N. Ford, London District Superintendent, London and North Western Railway, and Traffic Superintendent of the North London Railway, has kindly supplied the following explanation of these signals, believed to be unique. They are in the form of small fishtailed arms. An ordinary distant signal in the "off" position indicates that both home and starting signals are clear, and if the signalman is only in a position to lower his home signal and not the starting signal he must bring the train nearly to a stand before lowering the home signal. At Dalston Junction, however, if this were done the train would be in tunnel and out of sight, and these calling-on distants have, therefore, been installed to indicate to the driver that the home signal only is clear, and he may expect to find the starting signal against him.

[Reply to N. J.]

London and North Western Railway Water Troughs.

Water-troughs on the London and North Western Railway main line are situated between Pinner and Bushey, Wolverton and Castlethorpe, Rugby and Brinklow, Tamworth and Lichfield, Whitmore and Madeley, Preston Brook and Moore, Brock and Garstang, Hest Bank and Bolton-le-Sands and Low Gill and Tebay; also on the Birmingham line between Rugby and Brandon; on the North Wales line between Waverton and Chester, Connah's Quay and Flint, Prestatyn and Rhyl, and Llanfairfechan and Aber; on the Liverpool–Leeds line between Eccles and Weaste and Diggle and Marsden; and on the Liverpool–Crewe line between Halebank and Ditton; 17 sets in all and in the majority of instances serving four roads. For all further information of this character consult the RAILWAY YEAR BOOK.

[Reply to S. EDWARDS.]

West to North Railway Gradients.

From Birmingham to Derby, Midland Railway, the gradients are, on the whole, quite easy, east of New Street station. The tendency is generally falling to Whitacre Junction, and thence gently undulating, the steepest grades being about 1 in 400. The Great Western route *via* Henley-in-Arden from Birmingham to Stratford-on-Avon is fairly steeply graded in places. From Tyseley Junction there is a rise at moderate gradients to Earlswood Lakes, followed by a fall, mainly at 1 in 150, to near the junction with the Alcester branch. The downward tendency is continued, except for a peak beyond Aston Cantlow involving an up grade at 1 in 88, all the way to Stratford-on-Avon, and northbound trains have to face inclines at 1 in 106, 123, etc., with short sections at 1 in 48, 51, 71 and 88.

[Reply to "COMPARISON."]

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Dunstable Traffic, Great Northern Railway.

The example of St. Albans (London and North Western Railway) is not quite analagous to that at Dunstable, and these and other apparently similar cases are governed by the relations applying in each instance between the companies concerned. Thus in some cases there is a division of receipts and in others traffic is treated as local to the railway working the trains. As a "war economy" measure special arrangements have been made in several instances, and this applies, we understand, in the case of Great Northern tickets from Dunstable printed by the London and North Western Railway, by whom the accounts are dealt with.

[Further reply to H. V.]

Corridor Coaches, London, Brighton and South Coast Railway.

A few corridor coaches vestibuled for connection with other vehicles are in service on this line, but they are exceptional. Some may be seen on the 5 p.m. from London Bridge to Brighton. There are also coaches on the South London line having a side passage-way, though the compartments are not partitioned off. Carriages wherein a series of compartments have corridor communication for lavatory purposes are also in use. When the "Sunny South Special" was running London and North Western Railway vestibuled corridor coaches were used, and the Pullman cars are vestibuled, but these are not Brighton Company's property.

[Reply to J. C. DREW.]

The Busiest Railway Station.

Charing Cross is probably the busiest railway *centre* in London because of the combination of three "Underground" stations, and the enormous volume of interchange traffic which is also included. The South Eastern and Chatham terminus, above, adds its quota of traffic, but in itself is neither one of the largest nor the busiest stations in London. Of above ground stations the honours for terminal traffic lie between Liverpool Street (Great Eastern Railway) and Waterloo (London and South Western Railway), both of which deal with very large numbers of suburban passengers, besides a considerable amount of main line traffic.

[Reply to W. HUGHES.]

Non-stop runs on the Glasgow and South Western Railway.

During one season when the train was first instituted, the 11.50 a.m. summer express from St. Pancras to Glasgow was run by the Glasgow and South Western Railway non-stop between Carlisle and Glasgow, thus stopping only at Shipley and Carlisle on the 424 miles' journey between the two cities. But in the years prior to the war the customary stops at Dumfries and Kilmarnock were made also, though one or two trains ran between Kilmarnock and Carlisle with stops. We are not aware of any non-stops run having been made between Glasgow and Stranraer.

[Reply to ALEX. W. ANDERSON.]

London, Tilbury and Southend Railway Electric Rolling-Stock.

Although the electric motor and trailer cars employed for the Metropolitan District trains working through to East Ham and Barking over the London, Tilbury and Southend section of the Midland Railway are also used on a general basis on all District routes, a considerable number are actually the property of the Midland Company, as their contribution towards the material for working their services, and are so marked. Many of these coaches have not yet had the name "Midland" substituted for London, Tilbury and Southend Railway, presumably owing to the delaying influences of the war.

[Reply to A. Z.]

Rickmansworth and the Great Central Railway.

At Rickmansworth the line used by the Great Central Railway trains is jointly owned with the Metropolitan Railway, and the Great Central line proper does not commence until Quainton Road Junction, beyond Aylesbury. There is an alternative route *via* High Wycombe and Princes Risborough, but this is for the bulk of its length owned jointly with the Great Western Railway. Either of the two might be referred to as the "Great Central Main Line," as both are used by the long-distance trains of the latter company.

[Reply to S. EDWARDS.]

Great Northern Railway 0-6-2 Tank Engine, No. 1589.

Although all the rolling-stock used by the Great Northern Railway in the London district is fitted with vacuum

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automatic brake, it should surely occur to you that trains composed of other companies stock require at times to be worked over the Great Northern Railway, and in the case of Westinghouse-fitted stock it is obviously necessary to employ a Westinghouse-fitted engine. This is the reason why No. 1589, in addition to a few other Great Northern Railway locomotives, is equipped with both brakes.

[Reply to J. A. DICK.]

War Department Light Railway Locomotives.

Many of the American locomotives used during the war on the military lines have no doubt been taken back to the United States and Canada; but the small engines built to the order of the British Government, as also those constructed by firms here, are included in the sales which are being conducted by the Disposals Board. Some are still in use for military and clearing up purposes, while others are run on suitable lines in many parts of the world, according to their purchasers.

[Reply to " SAPPER."]

Speed over Water Troughs.

On the Great Northern Railway the troughs are more widely separated than on other leading lines on which equally heavy trains are run; it has therefore become customary to slacken speed when taking water on the Great Northern Railway, as the maximum amount is picked up at a speed of between 30 and 40 m.p.h. Since the installation of troughs near Knebworth, however, reduction of speed on the Great Northern Railway expresses at troughs is much less common than formerly.

[Reply to T. A. CORBETT.]

Locomotive Tenders.

At ordinary times it would be somewhat unusual for engines to be " paired " with tenders belonging to other locomotives, but arrears of repairs doubtless make the practice more common at present than normally. Some lines, such as the London and North Western Railway, number their tenders in a separate series, so that any such transposition is not noticeable in such cases: but on lines such as the Midland where the tenders carry by far the most prominent numbers, the practice is certainly not intended to be a common one.

[Reply to J. ARMES.]

The " Largest " Locomotive.

This constantly-recurring query appears once more in a new guise. At the same time it should not be put by a reader of the RAILWAY MAGAZINE seeing that the Midland 0-10-0 locomotive was described, with full particulars, so recently as the April number. As this engine weighs, without tender, 73 tons 3 cwt., it is manifestly not a candidate for the honour of being the largest locomotive in the United Kingdom, against No. 111 " The Great Bear," whose weight has been stated time and again in these pages.

[Reply to " COMPARISON."]

" Lifting " Coaches.

When coaches are " lifted," it usually implies that the wheel-tyres, the bearing surfaces of axles and axle-boxes, &c., have been re-turned; for this purpose the coach body must be lifted off the wheels. At the same time a general overhaul generally takes place. Such coaches are then placed on light duty until they are in thorough running order again. Owing to limitations of space, we cannot answer more than two questions in one issue nor can we set a precedent of the kind you desire.

[Reply to T. A. CORBETT.]

Pilot Locomotives.

There is no serious reason theoretically why the more powerful of two engines of a piloted train should run in front, unless the disparity in power or unsuitability for fast running be such that at high speeds (in the case of an express) the weaker engine should not develop sufficient tractive power to propel itself at such a speed. If such a state of things were feared, the latter engine should certainly be placed next the train, but the contingency is a remote one.

[Reply to " DIRECTOR 4-4-0."]

Engine Sheds, Great Western Railway.

Initials in most cases suggest the names of the depots on this line. Thus, Paddington is PN, Oxford OXF, Bristol BL, Pontypool Road PPL; so that there is no need to give the list in full. A few are, however, not quite so clear, owing to similarities to others, and the following may be mentioned: CAR Carmarthen Junction, CDF Cardiff, NA Newton Abbot, NEA Neath, STJ Stourbridge Junction, WOS Worcester, WES Westbury.

[Reply to C. B. FIRTH.]

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North London Railway Hatfield Services.

North London Railway trains regularly worked to Hatfield between August, 1877, and June, 1879. Two trains ran, first the 6.48 p.m. from Broad Street, and afterwards the 1.55 p.m. from that station. Specials conveying school parties etc., frequently ran to Hatfield on Bank Holidays, but these ceased about 15 years ago. When services are discontinued it is usually because it is found they do not supply a want.

[Reply to V. B.]

Norton Junction.

Arising from previous answers Mr. J. W. Hook, late stationmaster at Wadborough, writes that before the war two Midland trains stopped regularly at Norton Junction daily, tickets being collected for Worcester, but this stop was taken off during the war. No trains from Worcester to Birmingham stop here, but occasionally during the war period they stopped to pick up soldiers from Norton Barracks.

[Further reply to "CHELTONIAN."]

Snifting Valves.

Projections above the boi'er, immediately behind the chimney, of Great Eastern, South Eastern and Chatham, Caledonian and other modern superheater engines are snifting valves, designed to admit cold air to the superheater tubes and prevent them from burning out when the engine is "coasting," *i.e.*, running with steam shut off. We do not undertake to give locomotive dimensions.

[Reply to "G.E.R. ENTHUSIAST."]

The "Heaviest" Express Locomotive.

Present weight in working order of "The Great Bear," without tender, is 97 tons, and of the London, Brighton & South Coast Railway 4-6-4 tank, "Charles C. Macrae," 98 tons. The weights in the paragraph you quote were those of the engines as originally built, but the former locomotive has now been rebuilt with superheater, and the latter modified in certain details.

[Reply to "FOUR-SIX-FOUR."]

4-4-2 tank engines, London and South Western Railway

As stated in the RAILWAY YEAR BOOK there are still 80 of these engines, but they are gradually being withdrawn, firstly because of their age, as the class dates back to 1877, and secondly in consequence of electrification of the London suburban lines which has rendered them to some extent superfluous, though there are branch lines where they are or can be used.

[Reply to "WINTONIAN."]

2-6-0 Engine, No. 810, South Eastern & Chatham Railway.

At the moment of writing this engine is stationed at Bricklayer's Arms, and is working goods trains between there and Richborough. The duties of this, as of most other locomotives, are subject to constant change. The 2-8-0 R.O.D. engines on this railway take their share of the ordinary goods service over the South Eastern section of the railway.

[Reply to J. S. BARTLETT.]

The 8-hour Day.

So far as London & North Western Railway is concerned there are no instances where more than the 8-hour day is worked by enginemen, nor is it possible for the particular men you mention to work trips to London and back within the prescribed time. For these men, there is a period of rest before making the return trip.

[Reply to E. LITTLE.]

Great Northern Railway Locomotives at Neasden, Great Central Railway.

The engine you noticed may have worked up specially to London via the Great Central Railway route from Annesley, but more probably it was one of those temporarily lent to the London and South Western Railway and which had reached Neasden via the North and South West Junction and Midland Railways.

[Reply to J.L.H.]

Motors for Electric Rolling-Stock.

As the London and South Western Railway trains operate on routes where stations are not very close together, they are adapted for higher running speeds than on the Metropolitan District Railway, so that effective comparisons cannot be made between them in regard to relative power capacities.

[Reply to "HAMPTONIAN."]

Locomotive Sub-Depots, London and North Western Railway.

We cannot give this information in detail, but may mention that the sub-sheds under No. 8 (Rugby), are Coventry, Market Harboro', Peterborough, Seaton,

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Stamford and Warwick (Milverton), and under No. 10 (Aston, Birmingham), Monument Lane and Tipton.

(Reply to E. A. KNAPPETT.]

"Cornish Riviera" Express, Great Western Railway.

We are informed that this train has been worked by "County" class 4-4-0 engines, in the earlier days of its existence; when first put on, and running via Bristol —a 246 miles' journey—it was worked almost exclusively by "City" class 4-4-0's for the first summer or so.

[Reply to S. DIESCH.]

A Signal Anomaly.

We understand that the "stop" signal bearing the "distant" fish-tail marking which you have noted was installed temporarily until a correct arm could be supplied. To meet the needs of the moment the points of a distant arm were cut off; hence the anomaly.

[Reply to L. B. HEWITT.]

Head Codes, Great Northern Railway.

Blue discs with white cross, and white discs with red cross are principally used in the London district for Great Northern goods trains travelling through to the southern railways, in view of the fact that head codes of that kind are used on those lines to indicate destination.

[Reply to "SIDCOTIAN."]

Highland Railway 4-6-0's, Nos. 74-78

We can trace no reference in the RAILWAY MAGAZINE to the effect that these engines had been transferred to the Caledonian Railway. You are probably referring to the earlier 6 ft. series, now numbered 938-943 in the locomotive stock of the latter company.

[Reply to K. GILFILLAN.]

Tunnels with Four Tracks.

There are no long tunnels in the United Kingdom which contain four tracks, but there are a few instances of short tunnels of this description, one example being found between Edge Hill & Lime Street, Liverpool, London and North Western Railway.

[Reply to J. N. RATCLIFFE.]

New 4-cylinder 4-6-0 engines, Great Western Railway.

The 4-6-0 engines of the standard 4-cylinder type, with 15 in. cylinders, now building at Swindon, will doubtless take their turns on ordinary duties. We do not answer more than two queries in any one issue.

[Reply to "LODE STAR."]

Permanent Way Cautions.

On several railways the arrow-shaped horizontal green board, showing at night a white and green light, is used as a kind of "distant signal" for the caution itself, the commencement of the latter being indicated by the illuminated "C."

[Reply to J. H. SCOTT.]

Piloting on the Midland.

Heavy grading, together with certain restrictions on total engine weight, which hamper locomotive constructional developments, are responsible for the limitation of loads hauled by one engine on this railway.

[Reply to T. T.]

Cricklewood-Acton Line, Midland Railway.

This section has many times been referred to in the RAILWAY MAGAZINE, but not in the form of a specific article. It was constructed under an Act passed in 1864 and vested in the Midland Company in 1874.

[Reply to "ENQUIRER."]

Longest Non-stop Runs.

Paddington-Plymouth, 225¾ miles, Great Western Railway, is the longest run regularly made without stop on any railway. The distance from New York to Washington is given as 226 miles, but it is not run without stop.

[Reply to G. G.]

Lancashire, Derbyshire and East Coast Railway.

First section of this line was opened in 1896, and it was taken over by the Great Central Railway, January 1, 1907. Its engines have many times been illustrated in the RAILWAY MAGAZINE.

[Reply to "WINTONIAN."]

London and South Western Railway Power Classification.

We have answered this question on several occasions. The letters below the running plate of London and South Western locomotives, adjacent to the buffer-beam, indicates a classification for traffic.

[Reply to G.M.O.]

"Sir Sam Fay" class 4-0-6's, Great Central Railway.

Sir Sam Fay, the pioneer engine of the class, is painted in passenger colours, *i.e.*,

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green with brown framing, but Nos. 424-428 are painted black with red lining, as the goods engines.

[Reply to F. R. ALEXANDER.]

New 3-Cylinder 4-6-0 Engines, North Eastern Railway.

These engines are classified as "S.3." This information was stated when we illustrated the engine recently. It is proposed at present to build 10 locomotives of this class.

[Reply to K. GILFILLAN.]

Cannon Street Signal Cabin, etc.

This contains 243 levers. 2-6-4 tank engine No. 790 is, we understand, at present stationed at Bricklayers' Arms. It generally works on the main routes to Folkestone, &c.

[Reply to D. S. EAST.]

Mail Trains, Glasgow and South Western Railway.

No special trains for postal purposes only are run by this company, but mails are of course carried as necessary by the ordinary trains.

[Reply to ALEX. W. ANDERSON.]

"Scott" class 4-4-0's, North British Railway.

Original engines of the "Scott" class had boilers pressed to 190 lb. per sq. in., but in the later superheated engines the pressure has been reduced to 170 lb.

[Reply to A.G.S.]

New Locomotives, South Eastern and Chatham Railway.

We understand that fifteen 2-6-0 locomotives are under construction for this railway and that seven 2-6-4 tank engines will then be put in hand.

[Reply to G. H. E.]

Highland Railway Locomotives.

Mr. C. Cumming's latest 4-6-0 engines of the "Clan" class weigh 62 tons 4 cwt. 3 qr., in working order, and the tender 42 tons 1 cwt. 3 qr.

[Reply to H. FORDE.]

Sleeping Cars, Great Western Railway.

Night trains on which sleeping cars are advertised are now included in the West of England services. Please see time-tables.

[Reply to "VODAS."]

2-8-0 Engines, Somerset and Dorset Joint Railway.

There is one class only of these locomotives, six in number, viz., Nos. 80-85 inclusive.

[Reply to "FOUR-SIX-FOUR."]

Derby-Bristol Section, Midland Railway.

It is not customary for Class 4 locomotives (the 4-4-0 compounds and the "999" class) to work over this section.

[Reply to "SINGLE-WHEELER."]

"Slow Lines," Great Western Railway.

Between London and Didcot the slow, or "relief" lines are on the north or right-hand side, looking towards Didcot.

[Reply to "CUT-OFF."]

Pennsylvania Railroad, U.S.A.

The headquarters of the Pennsylvania Railroad administration are at Broad Street Station, Philadelphia, U.S.A.

[Reply to "DANISH READER."]

Ludgate Hill-Wimbledon Service, London and South Western Railway.

We have no information as to the probable resumption of this service.

[Reply to F. W. IZZARD.]

Weir Feed Pump.

Midland engine you mention is the only one on that line so equipped.

[Reply to R. S. C.]

Automatic Couplings.

British railway goods wagons are not fitted with automatic couplings.

[Reply to "SEEPEEAAR."]

Midland Railway Locomotives.

There are now no named engines on the Midland Railway.

[Reply to "MIDLANDITE."]

0-6-4 Tank Engines, Midland Railway.

None of these locomotives has been superheated.

[Reply to "DERBY."]

"Limited" Expresses.

See reply to I.J.P. in the January issue, page 47.

[Reply to J. A. DICK.]

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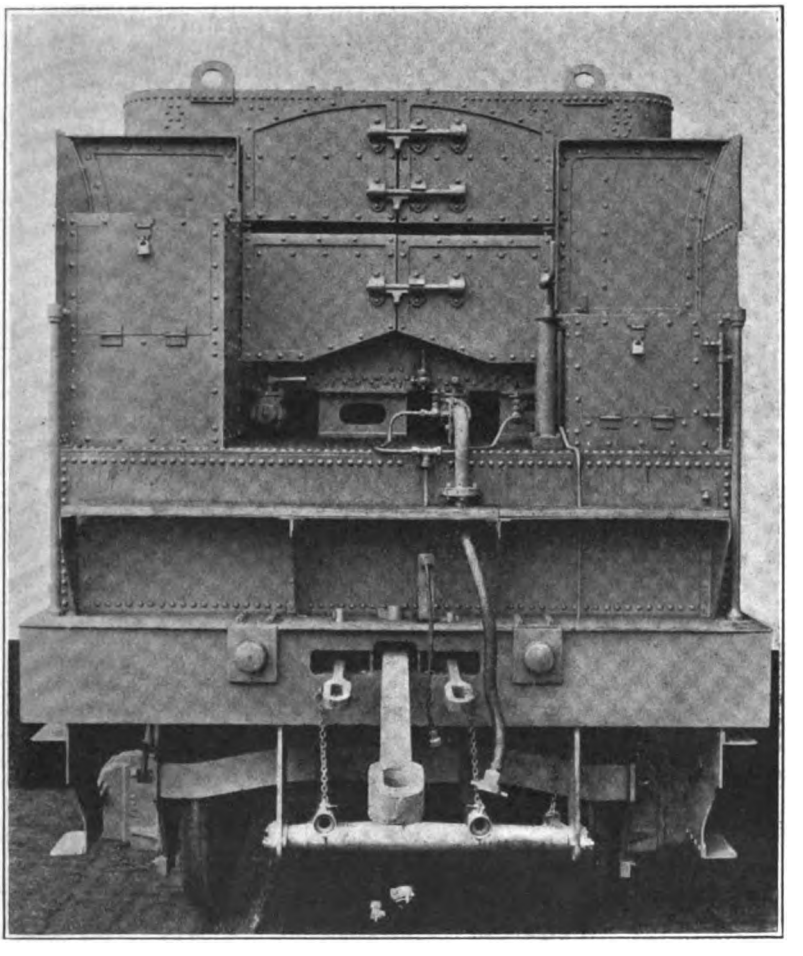
4-8-0 Oil-Fired Compound Superheater Locomotive,

CENTRAL ARGENTINE RAILWAY.



FRONT END VIEW OF OIL FUEL TENDER.

DESIGNED by Mr. J. P. Crouch, Chief Mechanical Engineer, Central Argentine Railway, 30 of these engines have recently been constructed by the North British Locomotive Company, Limited. Apart from the interest of the design as a whole, they are notable in that they maintain the practice of compound working with two cylinders only, in conjunction, however, with superheating apparatus and fittings for burning oil-fuel in view of the high cost

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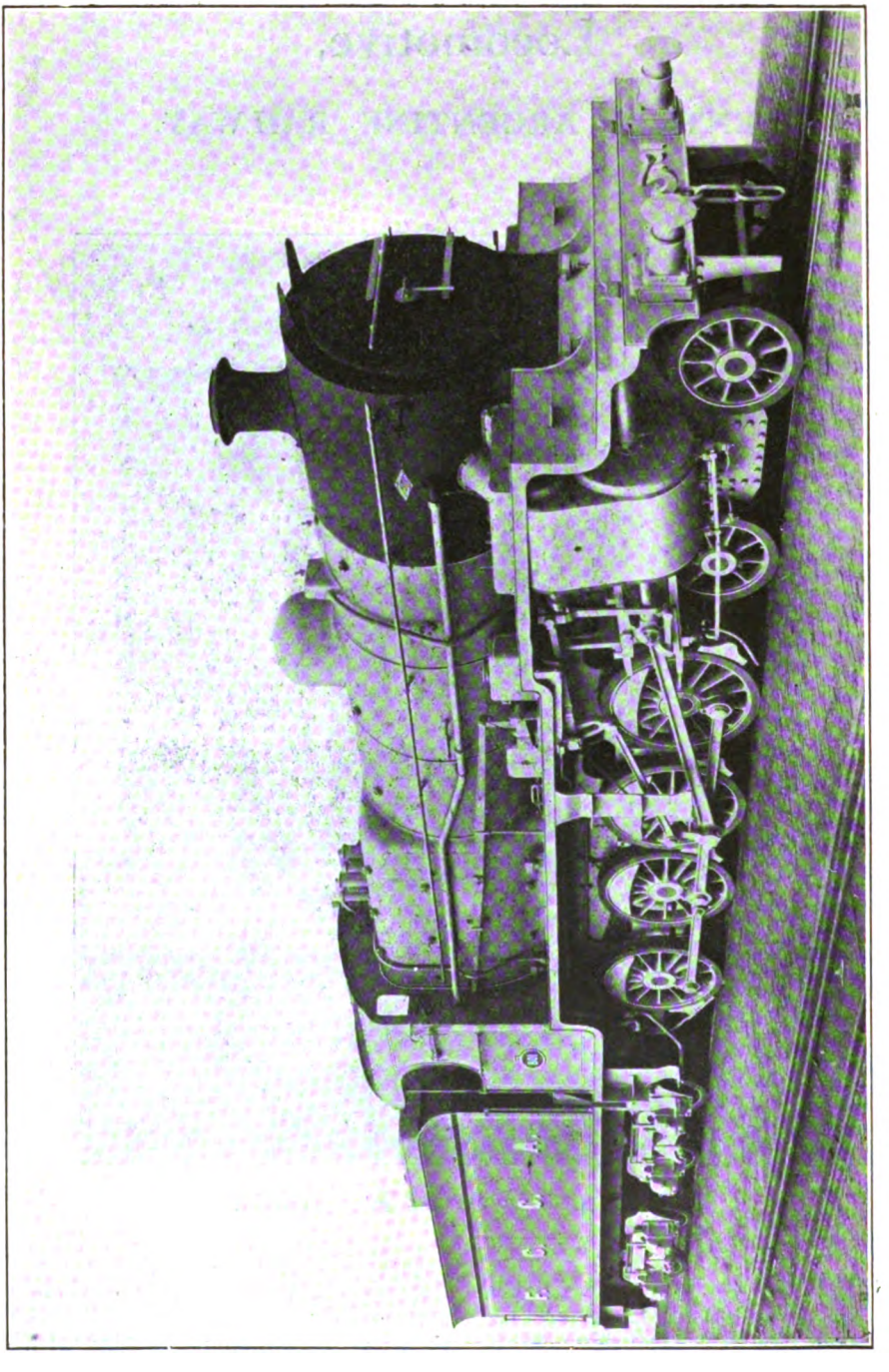

NEW 4-8-0 COMPOUND SUPERHEATED OIL-BURNING LOCOMOTIVE, CENTRAL ARGENTINE RAILWAY.

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of coal shipped to the Argentine. In other respects the design is in accordance with essentially modern practice, including Belpaire fire-box, top-feed, Walschaert valve-gear, Wakefield mechanical lubricators for valves, cylinders and coupled wheel axle-boxes, steam sanding gear, &c. These engines are designed for heavy freight service. The gauge is 5 ft. 6 in. The high-pressure cylinder is placed on the right-hand and the low-pressure on the left-hand side, the piston valves being above the cylinders. The connecting rods drive the second pair of coupled wheels, and the third pair are left without flanges to facilitate movement on curves. The wheels of the engine are acted upon by the vacuum brake and those of the tender by vacuum and hand brakes.

Change valves are fitted to enable the engines to be worked either simple or compound, as may be necessitated by varying conditions of running. The tractive force, when working simple in such large cylinders as those fitted in this case, is, of course, a very considerable one, but the demand on the boiler for steam is such that in the circumstances only temporary use can, or is intended to be, made of the valve in this connection.

Boiler diameter is 5 ft. 9 in. at the back end and is 13 ft. 6$\frac{7}{16}$ in. long between tube plates. The fire-box shell is 10 ft. long. It is fed by means of two Gresham & Craven's No. 10 injectors and is adapted for a working pressure of 180 lb. per square inch. The top feed apparatus is placed between the smokebox and the dome. Boiler plates are of steel, with tubes of the same material, the inside fire-box being of copper. The firebox is of the Belpaire type and has two sets of safety valves mounted upon it, placed alongside one another in pairs. The locomotive is equipped for burning oil fuel.

The footplate arrangements are of a commodious description and free from all unnecessary complication. The roofing of the cab extends well back and the footplate is as wide as can conveniently be arranged.

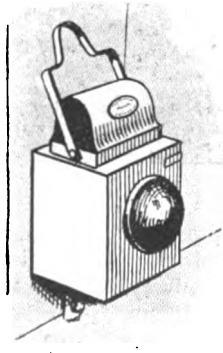
Heating surfaces of the boiler are as follows :—

Tubes	.. .. ..	1,393 sq. ft.
Firebox	.. .. ..	182 ,, ,,
Total	.. ..	1,575 ,, ,,
Superheater	.. ..	247 ,, ,,
Total	.. ..	1,822 ,, ,,

A grate area of 32·5 sq. ft. is provided.

The high-pressure cylinder is 21 in. and the low-pressure 30 in. diam., a common piston stroke of 26 in. being used. The coupled wheels have a diameter on tread of 4 ft. 7$\frac{1}{2}$ in. and the bogie wheels 3 ft. 2 in. The rigid wheelbase is 16 ft. 0$\frac{1}{2}$ in., and the total wheelbase 28 ft. 5$\frac{1}{4}$ in. A tractive force, at 60 per cent. of the boiler pressure, of 22,300 lb. is exerted.

The engine weighs in working order 80 tons 1 cwt., and of this weight 60 tons 15 cwt. are available for adhesion. The tender is of the eight-wheeled double bogie pattern, with outside framing for the bogies. The wheels have a diameter of 3 ft. 2 in., and are arranged on a wheelbase of 19 ft., giving a total wheelbase for engine and tender of 57 ft. 0$\frac{5}{8}$ in. The tank capacity is 6,000 gallons of water, and accommodation is provided for 7 tons of oil fuel.



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LOCOMOTIVE ENGINE AS A WAR MEMORIAL.

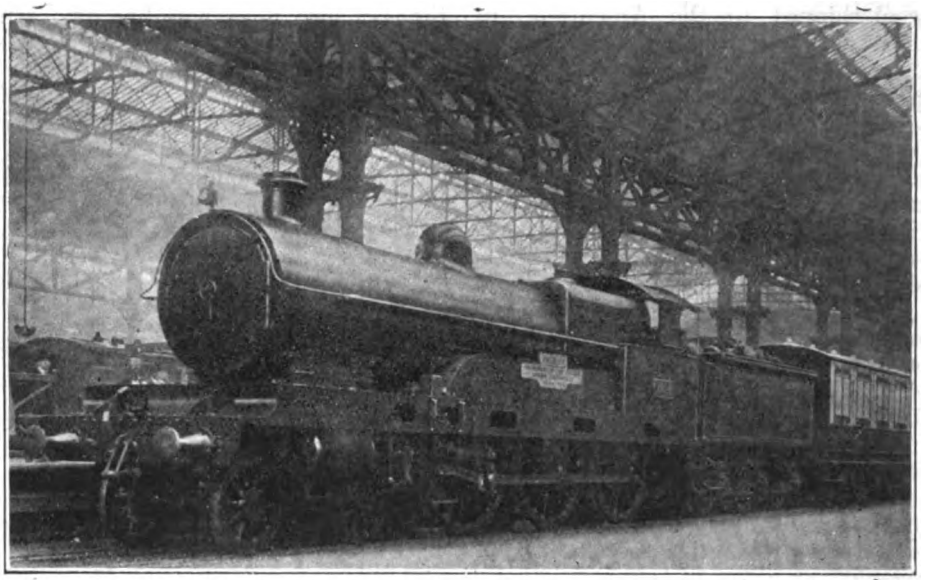

Photo.] [*W. H Whitworth.*

L. & N.W. R. No. 1914, "PATRIOT," AT LONDON ROAD STATION, MANCHESTER.

This engine has been specially numbered 1914, and in addition to the name plate it bears an inscription, reading—

IN MEMORY OF THE FALLEN
L. & N.W.R. EMPLOYEES
1914–1919.

NEW 0-6-0 TANK ENGINE, N. STAFFORDSHIRE RAILWAY.

TWO new 0-6-0 tank engines, Nos. 74 and 75, have recently been added to the locomotive stock of the North Staffordshire Railway. They have been purchased from Messrs. Kerr, Stuart and Co., and are of the class illustrated, painted, however, in accordance with the railway company's standards. Leading dimensions: cylinders, 15 in. diameter, 20 in. stroke; wheels, 3ft. 9in. diameter; steam pressure, 160 lb. per sq. in.; heating surface—tubes, 546 sq. ft., firebox 74 sq. ft.; grate area, 18 sq. ft.; water capacity of tanks, 800 gallons; fuel capacity, 65 cub. ft.; weight in working, 34 tons 3 cwts.

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ROBERT STEPHENSON.

ABOVE is a reproduction of a painting of Robert Stephenson, son of George Stephenson, and one of the foremost engineers of his day and generation. He was godfather to Sir Robert Baden Powell, the famous defender of Mafeking and the founder of the Boy Scout movement. A photograph of the Stephenson picture was recently presented to Sir Robert by Lord Roe of Derby, who has received a cordial letter of thanks in acknowledgment. The picture was left to Lord Roe by the late William Kirtley, whose cousin was the late Lady Roe, the daughter of Matthew Kirtley. William Kirtley was the Locomotive Superintendent of the London, Chatham and Dover Railway up to the time of its amalgamation with the South Eastern Railway in 1898, when he retired. As above indicated, he was the nephew of Matthew Kirtley, Locomotive Superintendent of the old Derby and Birmingham line, who retained that position on the union in 1844 of the three lines which formed the Midland Railway, viz., the North Midland (of which Robert Stephenson was for a time General Manager) the Midland Counties and the Derby and Birmingham. Matthew Kirtley, who it may be remarked drove the first locomotive that entered London in 1839, continued to occupy the post of Locomotive Superintendent of the Midland Railway until his death in May, 1873, when he was succeeded by the late Samuel Waite Johnson.

It is recorded of Robert Stephenson that when he retired from the general management of the North Midland it was considered desirable that he should be retained as Superintendent of the Locomotive Department at a salary of £1,000 a year, a sum which was secured to him by agreement. But when a Committee, who had proposed certain economies in the management, held their meeting, Stephenson not only gave valuable suggestions as to the best course that should be pursued, but, to set an example of the economy he wished to be practised, wrote a letter to the Chairman of the Company requesting that half of a considerable balance due to him might be cancelled, and that £400 a year might be deducted from his salary. "These sacrifices," justly remarks his biographer, "were the more to be commended because Mr. Stephenson had recently incurred losses to the amount of £10,000."

We are indebted for our illustration to the courtesy of *The Derbyshire Advertiser*.

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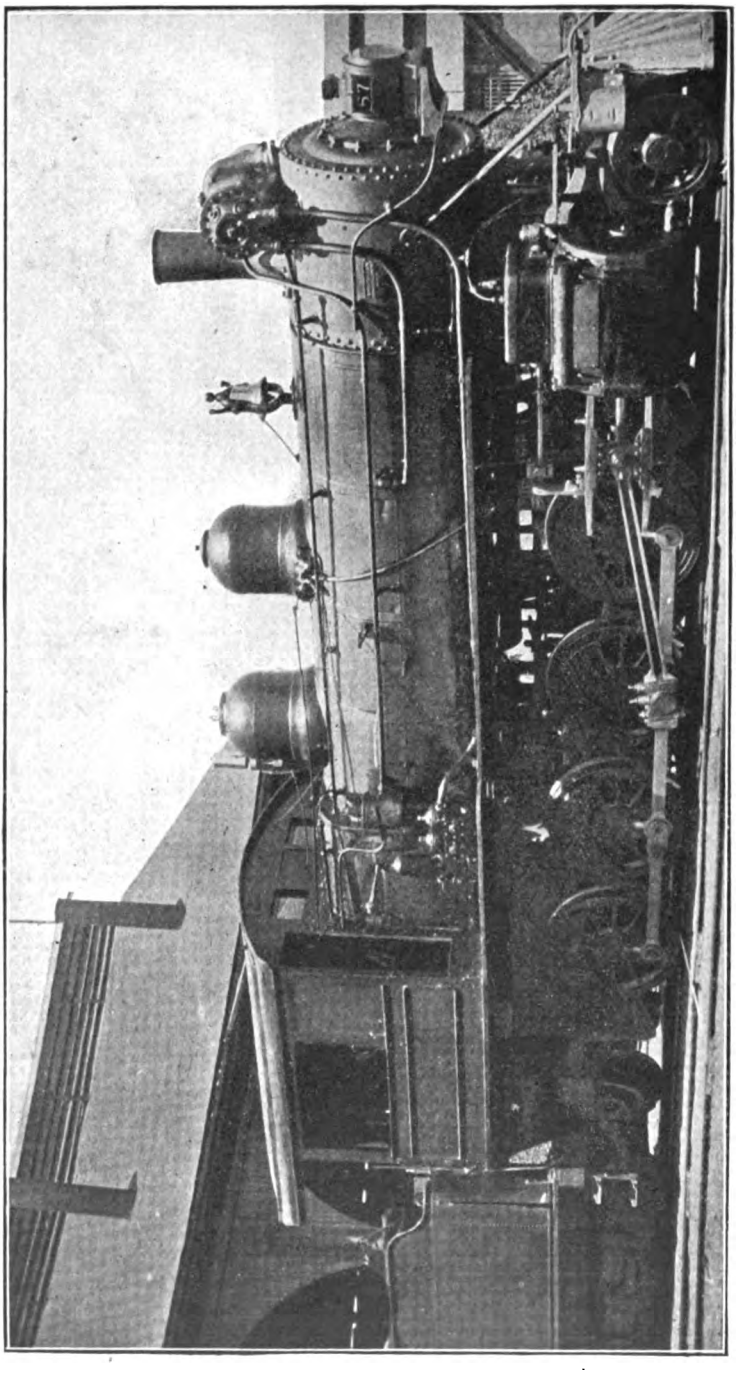

CROSS-COMPOUND FREIGHT LOCOMOTIVE, SOUTHERN RAILWAYS OF PERU, SHOWING FEED-WATER HEATER MOUNTED ON SMOKEBOX, AND PUMP ALONGSIDE FIREBOX

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Locomotive with Feed-Water Heater on the Southern Railways of Peru.

USE of exhaust steam for heating the feed-water supply to locomotive engines has so many advantages that the subject is continually receiving attention from locomotive engineers. In some countries, however, the matter is of greater importance than elsewhere, so that whereas under some circumstances the cost and maintenance of special apparatus are considered to out-weigh the gain to be realised therefrom, in other instances every possible means which will conduce to economy is welcomed. This applies especially in countries where fuel is scarce and expensive, so that a small economy has a distinctly substantial financial value.

Illustrated on the opposite page is a 4-8-0 compound freight locomotive belonging to the Southern Railways of Peru, fitted with feed-water heating apparatus which possesses several interesting features. Designed by Mr. H. E. Dalzell, Chief Mechanical and Electrical Engineer, Southern Railways of Peru, this apparatus, designed by him, and constructed in the railway shops, is being fitted to all locomotives as they come in for general repairs.

The engine has 20 in. and 31 in. cylinders and 28 in. stroke, and coupled wheels 52 in. in diameter.

The heater consists of a cast-iron body with tube sheets of gunmetal, to which ⅝ in. tubes are welded by acetylene. The feed-water passes four times through the heater, which has a surface area of 86 sq. ft. The size of the exhaust steam inlet is 5 in., while the exhausts of both feed and air pumps are led to the heater. The feed pump is double-acting, and is of 6 in. diameter by 10 in. stroke, and brass lined. A single brass valve is fixed in a chamber of special design, and is easily accessible. The pump works against 200 lb. boiler pressure and is driven by a standard 9.5 in. Westinghouse steam cylinder from one of their air compressors.

The cost of the complete equipment works out at £155 per set, and it is stated that the cost of repairs, both for heater and pump, has not exceeded £4 per locomotive in 18 months. The average initial temperature of the feed-water on the mountain divisions is 55 deg. F., and the final temperature on entering the boiler is 240 deg. Careful tests made over the same period disclose the fact that the use of the feed-water heating apparatus has effected a general saving in fuel of 10 per cent. With coal at the rate of £5 per ton, this represents an annual saving per locomotive of over £400.

THE RAILWAY MAGAZINE is indebted to Mr. Dalzell for the information here given and for the photograph reproduced.

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Great Eastern Railway:

LONDON SUBURBAN IMPROVEMENTS.

As recorded in the July RAILWAY MAGAZINE, Sir Henry Thornton, K.B.E., General Manager, Great Eastern Railway, recently, when addressing the members of the Institute of Transport, foreshadowed the introduction of steam train improvements on the lines under his control. The travelling public have not had long to wait for some of the promised accelerations. On Monday July 12 entirely new train schedules were introduced for the services on the Chingford, Enfield and Palace Gates lines. From Mondays to Fridays, inclusive, during the down "crush" period, between 5 p.m. and 7.30 p.m., 50 per cent. more trains (with proportionate additional seating accommodation) than have ever hitherto been provided in the services under notice are to run. On Saturdays, between about noon and 2.30 p.m., the figure is 58 per cent. The figure for the up morning crush period, *i.e.*, from about 8 a.m. to 10 a.m., is 75 per cent.; that for the Chingford line, between about 7 a.m. and 8 a.m., being 53 per cent. Train services at other times of the day are also very greatly improved.

At certain periods of the day short trains (with accelerated overall times), consisting of four coaches on the Enfield line and six coaches on the Chingford line, run in place of the standard 16-coach trains. For example, during the greater part of Sunday, instead of a 16-coach train running between Liverpool Street and Chingford every half-an-hour as formerly, there is a six-coach train with accelerated times every 10 minutes.

There are a number of through trains between Liverpool Street and Palace Gates, in addition to which auto-trains run between Seven Sisters and Palace Gates giving connections with Enfield line trains at Seven Sisters.

It may be asked by passengers who use the Ilford and Loughton lines, why should there be such a large increase of trains on the Chingford, Enfield and Palace Gates line and no material increase of suburban trains elsewhere—why should not the increase be spread over the entire suburban area? The reason is this: up to the present the absolute maximum number of trains that could be run with the available facilities has been run during the crush periods. To improve matters on any given branch structural and signalling alterations and additions must be made throughout the entire branch. If 99 out of 100 sections of a branch are made perfect and the one remaining section is not dealt with, the improvements on the 99 sections, so far as the running of additional trains is concerned, are valueless, thus as soon as any improvement at all can be made, maximum improvement is possible. Overcrowding is greater on the Chingford and Enfield line trains than elsewhere, consequently these sections of the suburban system have been dealt with first.

Re-arrangement of running lines and engine docks at the country end of Liverpool Street; alterations to platforms, barriers, exits, &c., at the City end of Liverpool Street; additional platforms, engine docks, water cranes, sidings, water and coal supplies at terminal and other stations; additional signals; re-arrangement of signal and point interlocking; electric and mechanical rail contacts and the provision of electric track circuiting to ensure the safety of the travelling public; standardisation of trains; the provision of additional locomotives, carriages and auto-trains; and the installation of telephones are a few of the matters that have had to be dealt with in connection with the improvements, and when it is borne in mind that the various works have had to be carried out so as to cause the minimum disturbance to existing traffic, it will be realised that some time must elapse between the conception and completion of improvements on any given branch of a railway.

In regard to the actual train schedules, the intervals between trains for various destinations have been kept as regular as possible, and the number of trains making a different combination of station calls has been kept as small as is possible at present. Unfortunately there is a greater number of combinations than can be considered ideal. This is brought about not only by the great deviation in the user of various stations by the public at different times of the day and the necessity of providing communication between intermediate stations for comparatively few people, but by the fact that the suburban trains under review for a portion of their journey have to pass over the same rails as are used by main line passenger and goods trains, express and otherwise, running between York, Peterboro', Norwich, Cambridge, &c., and London. These trains having connections from prac-

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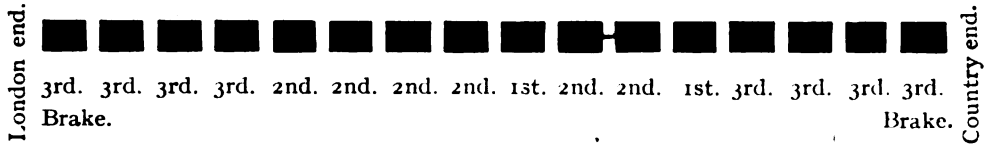
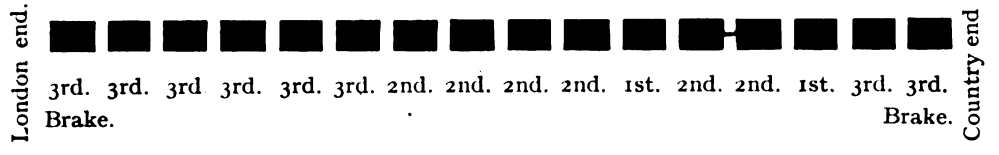
tically all parts of Eastern England and the Midlands, are consequently subject to delays and cannot be expected to arrive in the London area with the time accuracy of suburban trains. Down main line trains also have to be provided for. Stops on suburban trains have to be varied, therefore, in a manner which, at first sight, may appear somewhat arbitrary, in order to give the necessary paths for these main line trains.

During the crush periods, at which times 16-coach trains are used, the varieties of trains are not numerous.

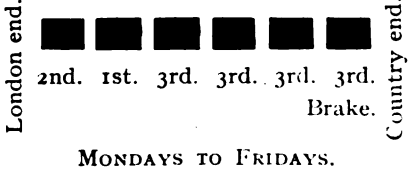
Except for unforeseen circumstances, 16-coach Chingford line trains are of the following formation :—



and 16-coach Enfield and Palace Gates line trains have the following formation:—



The six-coach train formation shown below is used on the Chingford line during the following non-crush periods :—



MONDAYS TO FRIDAYS.

Up.

10 8 a.m. to 3 18 p.m. } from Chingford.

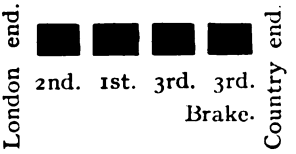
Down.

10 45 a.m. to 3 55 p.m. } from Liverpool Street.

SUNDAYS.

All day, except when the condition of the weather may necessitate longer trains being run after 6 p.m. Owing to the uncertainty of the Chingford line Sunday evening requirements, which depend almost entirely on the state of the weather, trains are scheduled to run in 16-coach train times, thus enabling full length trains to be run when necessary, although only six-coach trains may be used for the traffic.

The following four-coach train formation is used on the Enfield line during the undermentioned non-crush periods :—



MONDAYS TO FRIDAYS.

Up.

10 a.m. to 3 6 p.m. } from Enfield.

Down.

10 40 a.m. to 3 50 p.m. } from Liverpool Street.

SATURDAYS.

Up.

3 15 p.m. to 11 26 p.m. } from Enfield.

Down.

4 0 p.m. to 12 15 night } from Liverpool Street.

SUNDAYS.

Up.

7 13 a.m. to 5 53 p.m. } from Enfield.

Down.

7 55 a.m. to 6 35 p.m. } from Liverpool Street.

The running of short trains in accelerated times during certain portions of the day necessitates the two first class coaches being separated on the 16-coach trains, because when a portion of a 16-coach train is uncoupled to form a smaller train it is essential that the coaches at the point of division should be those fitted with long buffers and screw couplings. The only vehicles so fitted are second-class coaches, hence the formations indicated above, which may be modified in the future.

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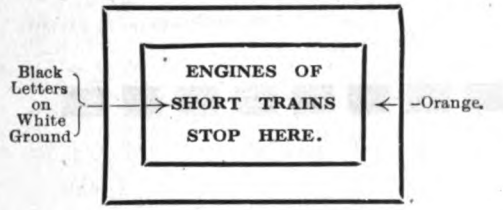
In view of the greater difficulty of seeing a vertical symbol such as a figure 1, 2 or 3, when on a vehicle in motion, as compared with a horizontal band, first-class carriages have a yellow band painted upon them throughout their length near the roof, and second-class carriages may be similarly identified with a blue band, in order that passengers may quickly discern the class of carriage in which they wish to travel.

Short trains as far as possible, stop in such positions as give waiting passengers the benefit of station awnings, the place at which the engine of a short train comes to rest being indicated by a board thus :—



At Liverpool Street, whilst still retaining one staircase communicating with platform No. 1, this platform is now connected on the level and will shortly be in direct communication with the main circulating space.

Platforms Nos. 2, 3, 4, 5 and 6 now have a circulating space on the train side of the barriers (temporary structures being provided until such time as the permanent barriers are delivered) thus enabling passengers to leave a platform by a much larger number of exits than is the case at present.

Time-tables and notices are exhibited at Liverpool Street and elsewhere in connection with the new services, in addition to which each engine carries the destination board of the train as hitherto, and brake vans (viz., the carriages at each end of a 16-coach train or at one end of a short train), as far as possible, carry boards indicating the stations *en route* at which the particular train does not stop.

Notices in connection with the Chingford line are printed on yellow paper, those in connection with the Enfield line on blue paper, and those in connection with the Palace Gates line on pink paper.

Chingford line trains depart from Nos. 2 and 4 platforms at Liverpool Street; Enfield and Palace Gates line trains from Nos. 1 and 3.

The officers and men of the Great Eastern Railway are doing all they can to give a successful service, and the public are asked to co-operate.

Various types of trains, viz., those with different combinations of stops, are, for the benefit of the staff, identified by numbers: odd numbers for down trains, even numbers for up trains; and although trains carrying the great majority of these numbers run only very occasionally (six types only, for example, being run in the down crush periods to serve Chingford, Enfield and Palace Gates lines), a complete list may be of use to the public and can be obtained on application at the stations.

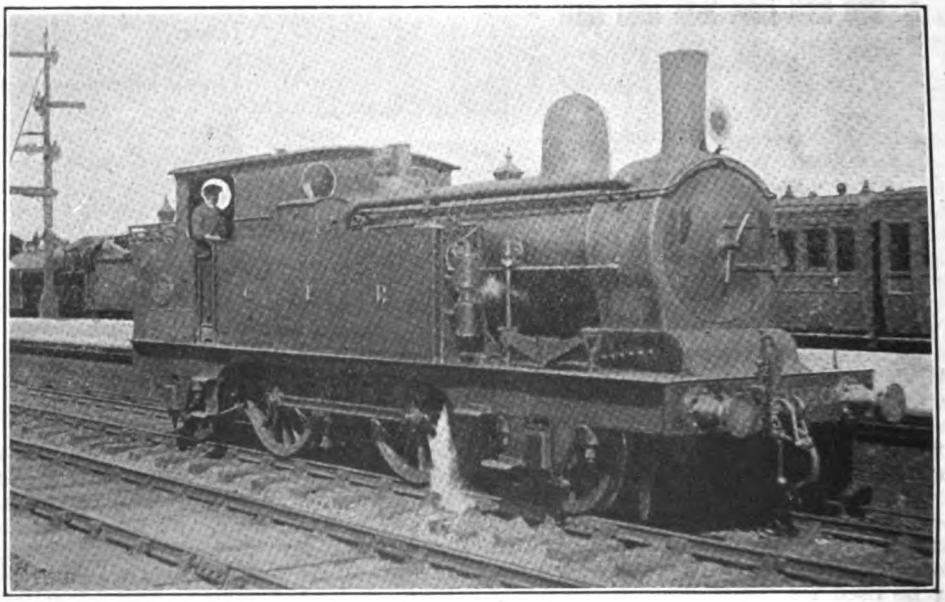


Photo. GREAT EASTERN RAILWAY. [*K. A. C. R. Nunn.*

Large 2-4-2 tank engine, No. 1080 (C32 class) at Southend.

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PERTINENT PARAGRAPHS

2-6-0 Locomotives : London, Brighton and South Coast Railway.

In 1913 Lieut.-Colonel L. B. Billinton, C.B.E., placed in service a series of 2-6-0 engines which throughout the war period rendered exceptional service. One of these locomotives, No. 339, has been rebuilt at Brighton Works, and is illustrated as frontispiece to this issue of the RAILWAY MAGAZINE. Seven new engines of the modified class are under construction. In general appearance, No. 339 looks somewhat strange, owing to the fact that it now has a second dome, in conjunction with the top-feed water delivery. By fitting a second dome the " trays " associated with the top-feed are made sufficiently deep to prevent any deposit being carried over into the boiler, notwithstanding the high velocity of the delivery water.

Feed-water is heated in the tender tanks by means of exhaust steam, a Weir feed-pump being fitted alongside the firebox. A steam cock and ejector are provided to conserve heat usually wasted by blowing off at the safety valves, the excess steam being diverted into the feed-water in the tender tank. The reversing shaft is fitted with a clutch operated by compressed air, thus steadying the motion and relieving the thrust upon the reversing rod and screw when the engine is working. The superheater is of Robinson type, and a Wakefield mechanical lubricator is fitted

Leading dimensions are as follows :—

Cylinders	.. ..	21 in. by 26 in.
Coupled wheels	.. ..	5 ft. 6 in. diam.
Leading wheels	.. ..	3 ft. 6 in. diam.
Steam pressure	.. ..	170 lb. per sq. in.
Heating surface—		sq. ft.
Tubes (2¼ in.	.. .. ..	790
Tubes (5⅛ in.)	.. .. ..	366
Firebox	.. ..	139
Total	.. .. ..	1,295
Superheater	.. .. ..	279
Total	.. .. ..	1,574
Grate area	.. ..	24·8 sq. ft.
Weight of engine in working order	..	63½ tons.
Weight of tender in working order	..	41½

Institute of Transport First Annual Dinner.

Under the chairmanship of the Rt. Hon. Sir Eric Geddes, G.C.B., G.B.E., M.P., President, the first annual dinner of the Institute of Transport was held on Friday, June 25, at the Royal Automobile Club, Pall Mall. Supporting the President were the following officers and members of the Institute :—Sir Sam Fay; Sir Henry Maybury, K.C.M.G., C.B., and the Hon. Sir Arthur Stanley, G.B.E. (Vice-Presidents); Sir Joseph Broodbank (Hon. Treasurer); H. E. Blain, C.B.E. (Hon. Secretary); H. P. Currie; G. A. Dutfield; Sir Maurice Fitzmaurice, C.M.G.; S. E. Garcke; H. H. Gordon, L.C.C.; Sir Linden Macassey, K.B.E., K.C.; Sir Julian Orde; Sidney Preston, C.I.E., C.B.E., ; E. S. Shrapnell-Smith, C.B.E.; F. Tatlow, C.B.E.; Sir George Beharrell; Sir Thomas Williams; A. Watson; P. Burtt; E. H. Burrows; Sir J. B. Ball; R. H. Selbie; Colonel Barrington Ward; P. G. Killick; and Neville de B. Priestley.

Among the large company present were representatives of principal railway companies, commercial and public service transport undertakings, canal and dock authorities, coast-wise shipping interests, county and municipal engineering profession, while the guests included :—The Rt. Hon. Edward Shortt, K.C., M.P.; Arthur Neal, M.P., Parliamentary Secretary, Ministry of Transport; The Rt. Hon. The Earl of Bessborough, K.P., Chairman London, Brighton and South Coast Railway; The Rt. Hon. Viscount Knaresborough, Chairman, North Eastern Railway; The Rt. Hon. Lord Riddell; Sir Gilbert Claughton, Bart., Chairman, London and North Western Railway; Sir John Courtis, President, Municipal Tramways Association; Sir J. D. Rees, K.C.I.E., C.V.O., M.P., South Indian Railway; Colonel R. E. B. Crompton, President, Commercial Motor Users' Association; R. S. Tilling, J.P., Chairman, London and Provincial Omnibus Owners' Federation; John Wilmot, President, Surveyors' Institution; J. Thompson, President, Institution of Municipal and

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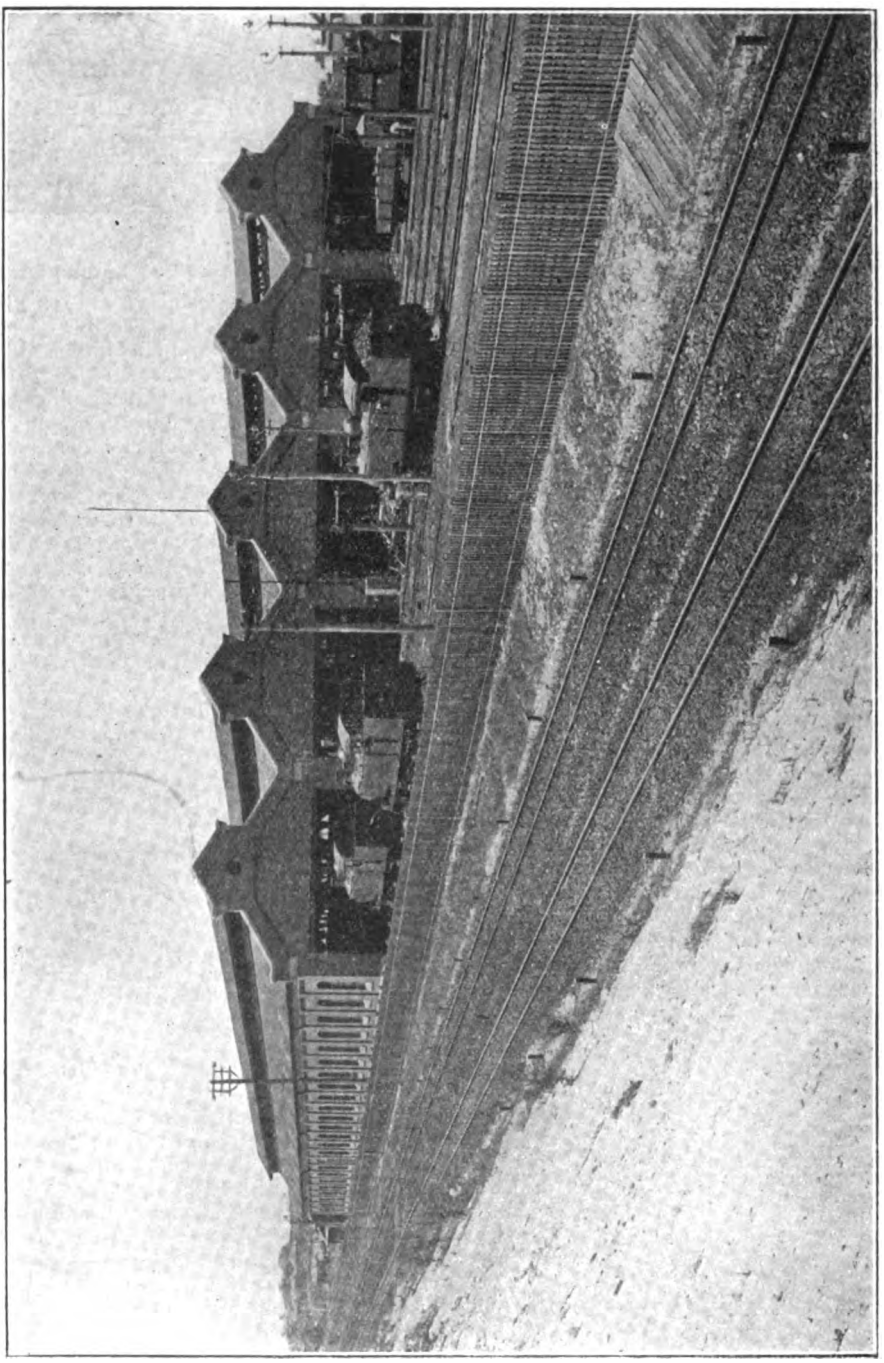

NEW LOCOMOTIVE RUNNING SHED, EAST PERTH, WESTERN AUSTRALIAN GOVERNMENT RAILWAYS.

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County Engineers; W. H. Stentiford, President, Chartered Institute of Secretaries.

In proposing the health of the Institute of Transport, the Rt. Hon. Edward Shortt, described it as the complement to the Ministry of Transport, as a necessity to meet the new orders and conditions of the times, and as an essential means for training the transport experts of the future. In replying the President naturally referred to the incident on the preceding evening, when he had been prevented, on a technical point, from stating his proposals for the future of railways in the House of Commons. The House had been deprived of a "very fine speech," and the Institute "of a better." As regards the Institute of Transport, it now has more than 600 members, including graduates and students, and he had pleasure in announcing an elaborate series of premium and medal awards available for members, with their donors, as follows:—

1. *Institute Medal* (*Gold*).—To be awarded triennially for the paper read or contribution to proceedings made during the preceding three years, adjudged first in order of merit.

2. *Railway Medals* (2) (*Gold*).—(Donors: The Railway' Companies' Association). To be awarded annually for the best paper or contribution on railway (*a*) Operating, and (*b*) Engineering subjects.

3. *Road Transport Medal* (*Gold*). (Donors: The Commercial Motor Users' Association). To be awarded annually for best paper or contribution on road transport subjects.

4. *Tramways and Light Railways Medal.* (*Gold*).—To be awarded annually for best paper or contribution on subjects relating to tramways and light railways.

5. *Water Transport Medal* (*Gold*).—To be awarded annually for best paper or contribution on subjects relating to inland waterways, docks, coast-wise shipping.

6. *Medals for Graduates and Students* (Silver).—To be awarded annually by the Institute, one each for best paper or contribution submitted by a graduate and by a student.

In a delightfully humorous speech, the Hon. Sir Arthur Stanley, G.B.E., proposed the toast of the Transport Industry, to which Sir Gilbert Claughton, Bart., replied in terms which indicated the whole-hearted desire of the railway companies to co-operate with the Ministry of Transport in the future conduct of national transport.

Sir Henry Maybury, K.C.M.G., C.B., proposed the health of "Our Guests," and Mr. Arthur Neal, M.P., who also developed a delightfully humorous trend of remarks, replied. The toast of the press was given by Sir Linden Macassey, K.C., K.B.E., to which Lord Riddell replied, emphasizing the fact that the Institute of Transport has a distinct responsibility for the education of the public in regard to transport, as well as in respect of the training of the new generation of transport officers.

In every respect the first annual dinner was a distinct success, to which the admirable management and organisation of the Hon. Secretary, Mr. H: E. Blair, C.B.E., contributed in no small degree, and constitutes a good augury for the future and progress of the Institute.

In conclusion we may repeat a statement as to the objects and functions of the Institute: To promote and encourage knowledge of traffic science and of the art of transport in all its branches, and the aims and appliances connected therewith; to provide facilities for the study and exchange of information and ideas on traffic problems, and all means and methods of transport; and to raise the status of those engaged in traffic and transport.

New Locomotive Depôt at East Perth.

THE Western Australian Government Railways have recently constructed a new locomotive depôt at East Perth, possessing features of interest. It covers an area of 22 acres and has approximately 6 miles of sidings. The yard is equipped with a coal bin of 200 tons capacity, fitted with 10 sets of coaling shoots, one 80 ft. diam. turntable erected on foundations of piles and concrete and surrounded by a brick retaining wall, and a hot water washout plant capable of dealing with two locomotives at one time.

The illustration reproduced on the opposite page, shows a general view of the depôt looking north, with the main line to Kalgoorlie on the left-hand side. The shed is of brick on concrete foundations and roofed with tiles. Its length is 362 by 187 ft. wide, and consists of five bays and accommodation for 50 locomotives. One of the bays contains the repair shops, which consist of hydraulic drop pits, machine, boiler and blacksmith shops. The other bays have two roads through each and the aggregate length of pits is 5,000 ft.

The machinery is driven and the whole of the depôt is lighted by electricity, and the shed is equipped with an overhead system of hot and cold water service for filling up boilers. The water supply is taken from a brook running across the eastern end of the yard, which, after treatment by a Paterson filtration plant, is pumped up into two 25,000-gallon tanks on a stand 80 ft. high. These tanks supply ten 8 in. water columns. The locomotive foreman's, sub-foreman's and clerk's offices

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are separate buildings. The gauge is 3 ft. 6 in., but clearances have been designed for 4 ft. 8½ in. in view of change of gauge possibilities.

An American view of English Railways.

IT is always interesting "to see ourselves as others see us," but it must be confessed that many Americans who have "aired their views" in regard to British railways have given sadly misleading impressions of the conditions and methods which obtain here. Mr. R. E. Thayer, European Editor of the *Railway Age*, is, however, a distinctly competent observer, and the following extracts from some observations recently made by him will be read with real interest and appreciation:—

"One of the first impressions that an American receives when he reaches Great Britain is the small size of the English locomotives, and as he looks back over the train of anywhere from 10 to 15 cars he wonders how a machine of such size can haul so long a train. The English locomotives are very small when compared to the more modern locomotives used in this country, but they do their work with an apparent lack of effort that is particularly noteworthy. The English locomotive is a beautiful thing to look upon; they are well proportioned and particularly well kept. The master painter of the British roads is still a most important person and he produces a beautiful product. The locomotives themselves operate as well as they look.

"The locomotives are specially well maintained compared to the locomotives in the United States, and the expression that 'they are built like a watch' is hardly an exaggeration. The English railways are obliged to work to much closer limitations in their construction of locomotives than we do in the United States. The weight of the locomotives is so carefully distributed on the wheels that no equalisation is found necessary. Inequality in wheel loads is regulated by the tension of the driving springs."

He then refers to various shop and constructional methods, and continues: "With such care taken in the construction of the English locomotive it will be readily understood that they do not suffer from any great maintenance troubles. These are further alleviated by the excellent roadbed found in England. With high grade construction and with excellence of roadbed, the riding qualities of the locomotives can well be surmised.

"The writer had the privilege of riding a Midland 4-4-0 engine, which had been out of the shops for 18 months and had exceeded its mileage. The engineer was a little upset because a visitor should be assigned to a locomotive in that condition and took particular pains to point out the fact that the locomotive was overdue for repairs. But its riding qualities were far superior to any of the most perfectly maintained locomotives in the States and would compare very favourably with the riding qualities of a good many of the coaches on some of our trains at the present time."

Great Eastern Railway and the Holidays.

THE East Coast is deservedly popular with those desiring rest, recreation, and bracing climate, and for such, the Great Eastern Railway is catering this summer, by placing at the service of the public additional trains, which will provide easy access to the popular seaside resorts. This improved and augmented service came into operation on July 12.

To the travelling public at the present time, hotel accommodation is a most important point, and particular attention is drawn to the fact that the company have recently purchased the well-known Felix Hotel at Felixstowe, one of the finest on the East Coast. Situated as it is in the most elevated position, it commands unrivalled views of the whole sea front, and a feature which will appeal to all is the picturesque gardens with the beautiful terraced lawns and parterres leading right down to the promenade. This Hotel has been thoroughly renovated by the company, and is now the Hotel de Luxe of this coast.

There are four other first-class Hotels under the management of this company. The Great Eastern Hotel at Harwich, situated facing the harbour and within a few minutes of Dovercourt, is an ideal centre for devotees of yachting and fishing; and for the traveller to the Continent, via Harwich and the Hook of Holland—and there will be many such this year—wishing to visit the battlefields of France and Belgium, there is an excellent Hotel at Parkstone Quay. Further North is an excellent Hotel at Hunstanton—The Sandringham—occupying a fine site on the sea front.

Finally, a word must be said as to the Great Eastern Hotel at Liverpool Street. This, together with the Abercorn Rooms adjoining, is in direct connection with the London terminus, and will be found a most convenient and up-to-date stopping place. Although situated in the heart of the City, it is readily accessible from the West-end and all parts of London by means of the "Metropolitan" or "Central London" Railways.

Now that there is a universal revival in

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golf, it will be of interest to mention the fine courses at Hunstanton, Cromer and Sheringham. All that the golfer desires will be found, too, at Yarmouth, Gorleston, Aldeburgh, Southwold, Clacton, Frinton, Felixstowe, and Harwich, to which can be added many fine sporting inland courses.

Doubtless there will be many American visitors this year to the scenes associated with the sailing of the Pilgrim Fathers, this being the Tercentenary of the founding of New England. For those proceeding to the celebrations in Holland, there is a daily service on week-days to and from the Hook of Holland, and on this passage only turbine steamers are in use.

The fact that the Olympic Games are being held this year at Antwerp will attract many travellers, and on this route has recently been placed the Great Eastern Railway's fine new steamer *Antwerp*. The sailings on this service are on Monday, Tuesday, Thursday and Friday of each week.

Sailings from Harwich to Esbjerg take place on Mondays, Wednesdays, and Saturdays, returning on Sunday, Wednesday, and Thursday of each week.

The Company have now reinstated the Harwich-Gothenburg service, the first sailing being from Gothenburg on July 7, and from Harwich to Gothenburg on July 14, and thereafter on every Wednesday in each direction.

METROPOLITAN RAILWAY INFORMATION BUREAU IN LIVERPOOL STREET ARCADE.

RAILWAY MAGAZINE readers, visiting London from the Provinces, should make a point of seeing this window which is proving a great attraction to City men.

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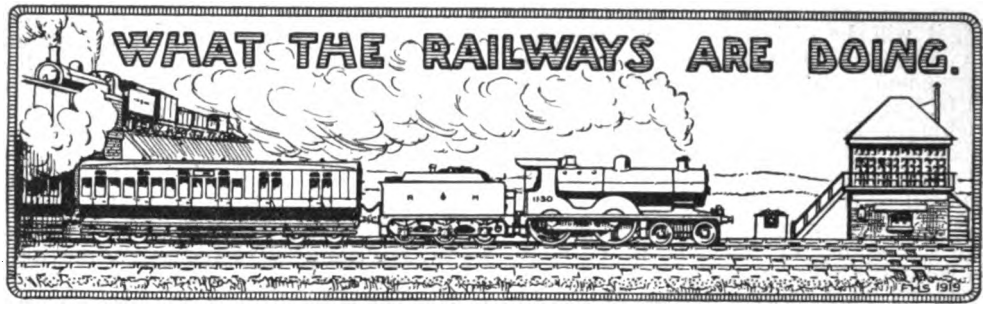

SIR JOHN NICHOLSON, C.M.G., who was recently appointed Chief Engineer for Docks, North Eastern Railway, started with the firm of Black, Hawthorn & Co., Locomotive and Marine Engine Builders, Gateshead-on-Tyne. In 1889 he became Assistant Engineer, Quebrada Railway and Copper Mines, Venezuela, and in 1891 was made Chief Mechanical Engineer of this undertaking and of the South Western Railway of Venezuela. From 1895 to 1899 Sir John was with P. W. & C. S. Meik, Consulting Dock and Railway Engineers, Westminster, and during that period designed the locomotives and rolling-stock and other plant for the Port Talbot Railway and Docks; he was also Resident Engineer of the Graving Dock at Port Talbot, and other sections of the undertaking. From 1899 to 1902 he was Chief Engineer of the Bridgewater Trust, and in the latter year was appointed Managing Director and Chief Engineer of the Tanjong Pagar Dock Company, Singapore. On the acquisition of that property in 1904 by the Government he was appointed Chairman and Chief Engineer of the Singapore Harbour Board and also of the Penang Harbour Board. Sir John was created C.M.G. in 1913, and Knight Bachelor in 1919.

SIR JOHN ROMNEY NICHOLSON, C.M.G.,
Chief Engineer for Docks, North Eastern Railway.

* * *

IT is with sincere regret that we have to announce the death, at the early age of 40, of Mr. Russell Willmott, which occurred at his residence, "St. Nicholas," St. John's Road, Newport, I.O.W., on June 25. Formerly Manager and Engineer of the Stratford-upon-Avon and Midland Junction Railway, at the end of 1911, he resigned his position as Manager in consequence of his appointment as Secretary and General Manager of the Isle of Wight Central Railway, but remained Engineer and Locomotive Superintendent of the Stratford-upon-Avon and Midland Junction Railway. He was also Engineer of the Edge Hill Light Railway Company, the construction of which is well on the way towards completion. His death is deeply regretted by the staff of the railways. Interred at Newport, Mr. Russell Willmott leaves a widow and three children.

* * *

MR. FELIX C. C. M. FIGHIERA, Secretary of the Central Argentine Railway, who has left Buenos Ayres on his return to London, was the chief guest at a lunch given by the Local Committee and General Manager of the Central Argentine in the dining hall at the Retiro Station. All the principal officers and important members of the company's staff were present, and at the close of the lunch Mr. Fighiera is stated to have made "an exceedingly good off-hand speech."

* * *

A VALUABLE solid silver Salver of celtic design, suitably inscribed, and an illuminated

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address containing the names of all the subscribers has been presented to Mr. C. B. Outon, on his retirement on superannuation from the position of Lighting Engineer of the Great Southern and Western Railway. Mr. Outon has been very popular throughout the system by reason of his courtesy and good fellowship.

* * *

MR. FRANK H. WILLIS, who has been appointed Goods Manager of the South Eastern and Chatham Railway, in succession to Mr. F. P. Igglesden (retired), has been assistant to that gentleman since 1911. Born in 1872, Mr. Willis is the second son of the late Judge William Willis, K.C., and was educated at Haileybury College, Hertford, and Trinity Hall, Cambridge. He took his B.A. in 1893, and, entering at the Inner Temple in 1894, was called to the Bar in 1897. Two years later Mr. Willis joined the Goods Manager's Office of the South Eastern and Chatham Railway, being at first attached to the rates department and specialising in all questions of rates disputes, particularly those of a legal character. When Mr. (now Sir) Francis H. Dent became Goods Manager in 1907, Mr. Willis's scope of work was considerably increased, and he was closely associated with that gentleman in the evidence he gave in two important cases, viz., Spillers and Bakers *v.* Great Western Railway, and the Scottish Demurrage case. Mr. Willis also appeared before the Russell Rea Committee in 1909, and was preparing a proof for submission to the Royal Commission on Railways, 1913, when the war put an end to its sittings.

MR. FRANK H. WILLIS,

Goods Manager,
South Eastern & Chatham Railway.

* * *

MR. F. A. BRANT, recently appointed Continental Traffic Assistant to General Manager, South Eastern and Chatham Railway, joined the London, Chatham and Dover Railway in 1889 at the time of the Paris Exhibition. He passed through the various traffic departments and was attached to the Superintendent of the Line in charge of timetables and special traffic until 1897 when he was transferred to the Continental Traffic Manager's Office, in which he became Chief Clerk in due course. In 1914 he was appointed Inspector of Continental Agencies with headquarters at Boulogne. From the outbreak of war until the end of 1915, he was in charge of the South Eastern and Chatham Railway interests at Boulogne, and rendered liaison services between the railway company and the Admiralty and War Office for the transport arrangements of the British Expeditionary Force. At the end of 1915 he was transferred to London and, owing to expert knowledge of foreign languages and intimate experience of Continental railway practice, he undertook special missions for the War Office Intelli-

MR. F. A. BRANT

Continental Traffic Assistant to General Manager,
South Eastern & Chatham Railway.

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gence Department to various parts of the Continent. He organised overland transport of coal for the Italian State Railways from Bordeaux at the time of the submarine menace in the Mediterranean, for which services he was made a Commander of the Order of the Crown of Italy. He also holds the Order of Chevalier of the Crown of Belgium for services to the Belgian State Railways.

* * *

Mr. ALFRED ASLETT, J.P., formerly Secretary and General Manager of the Furness Railway, is one of the British Delegates to the ninth Imperial Chambers of Commerce, to be held in Toronto, Canada, on September 16, and following days.

* * *

MR. JAMES FREDERICK GEE, who succeeds Mr. J. Chas. Isaac as Chief Accountant of the London and North Western Railway on August 1, entered the service in 1884. His earlier years were spent in the Audit and Expenditure Departments, and in 1887 he was transferred to the office of the Chief Accountant, then Mr. Frederick Whittle. He was private clerk to the late Mr. Parkhouse

MR. JAMES FREDERICK GEE,

Appointed Chief Accountant,
London & North Western Railway.

(the next Chief Accountant), and on the death of that gentleman in 1909, he was made Chief Clerk to his successor, the present Accountant. Mr. Gee was appointed Assistant Accountant in March, 1917.

MR. JAMES PAGE, formerly stationmaster at Taunton, has been appointed to succeed Mr. Weaver as Stationmaster at Paddington. Mr. Page joined the Great Western Railway service in 1876 as a lad clerk in the Telegraph Department at Slough, and after working

MR. J. PAGE,

Stationmaster, Paddington,
Great Western Railway.

at various stations in the London division, was transferred to the Divisional Superintendent's office at Paddington in 1880. Twelve months later he sought outdoor experience, and in 1888 became Stationmaster at Princes Risborough. Later, he was attached to the divisional relief staff until made Stationmaster at Slough in 1900. Four years later he was made Assistant Stationmaster at Paddington, and in 1913, Stationmaster at Taunton.

* * *

LIEUT.-COLONEL A. S. REDMAN, C.B., R.E., M. Inst. T., who has been appointed Traffic Superintendent of the Somerset and Dorset Joint Railway, in succession to Mr. G. H. Eyre, has been acting at the War Office as Deputy Director of Railways. His duties specially related to the movement of military traffic. He also acted as War Office intermediary with the Railway Executive Committee, and was the War Office Representative on several Railway Executive Sub-Committees. He was, in addition, a member of the Road Stone Control Board, which had the special duty

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of dividing the country into convenient zones for the distribution of road metal from the most convenient quarries, so as to reduce the railway haulage to a minimum. Lieut.-Colonel Redman is one of the foundation members of the Institute of Transport.

* * *

MR. H. F. LONEY, Chief Goods Manager, Midland Railway, has unveiled a memorial tablet at the goods offices at St. Mary's, Derby, inscribed with the names of the men employed at that station who gained honours in the war. The clerical department contributed 44 per cent. and the manual and wages department 45 per cent.

* * *

OVER 24,000 inhabitants of Swindon, or nearly half the population of the railway town, dispersed to the four quarters of the United Kingdom on Friday, July 2, by the Great Western Railway trip trains for employees at the company's works. Many special trains were engaged from the very early hours of the morning conveying trippers at the rate of more than 2,000 per hour.

* * *

THE Prince of Wales had a narrow escape in an accident to the Royal train near Bridgetown, Western Australia on July 5. When nearing Bridgetown his carriage, the last on the train, and the vehicle next to it, were derailed and dragged about 200 yards, tearing up the track. The two coaches then turned over. The Prince was unhurt and climbed "gaily through the window of the carriage."

* * *

AT a meeting of Chairmen and Deputy-Chairmen of the five Scottish railway companies, held in Edinburgh on July 2, to consider the Government's proposals for the future organisation of railway undertakings in Great Britain, the following resolution was unanimously passed: "That the scheme for the future of the railways as outlined in the White Paper is open to many objections, and would afford no protection to the proprietors of the companies, and that any Bill framed on similar lines must be strenuously opposed."

* * *

THE Great Western Railway, in July, resumed the practice of issuing time-books to the public, which had been discontinued owing to conditions created by the war. During the war sections of "Bradshaw" were reprinted for staff purposes only. The new timetables cover the period from July 12 to September 30, 1920, and are published at the price of sixpence. They comprise 184 clearly-printed pages and good maps of different sections of the system.

* * *

RAILWAY MAGAZINE readers who are visiting Stratford-on-Avon for the Shakespeare Summer Festival which terminates on August 28, will have an opportunity of likewise exploring the territory served by the Stratford-upon-Avon and Midland Junction Railway. This line forms a connecting link between the main lines of the Midland, Great Central, and London and North Western Railways, and is one of great interest to all who study railway ramifications. Mr. A. E. Diggins, the General Manager, will send full particulars of trains, post free, to applicants.

* * *

MR. J. H. BURNS, Traffic Manager, Wirral Railway, from his office at New Brighton Station, Cheshire, will be pleased to supply RAILWAY MAGAZINE readers on application, with a copy of the company's new holiday and residential guide. The booklet includes an excellent pictorial route map of the Wirral Railway district and illustrations of the principal stations. Readers still undecided as to where they will spend their autumn holidays should secure copies.

* * *

The Great Bear, the Great Western Railway "Pacific" type locomotive, has again passed through the shops recently, and received a new livery. She has resumed work between Paddington and Bristol.

* * *

NEW 4-4-0 superheater locomotives of the "Glen" class recently added by the North British Railway, include Nos. 490 *Glen Dessary*; 502 *Glen Fintais*; 503 *Glen Asklet*; 504 *Glen Aladale*; and 505 *Glen Cona*. These bring the total of the class to 25. Mr. W. M. Stephen, in sending this information, points out that No. 490, replaces one of the "Drummond" 4-4-0 locomotives described by Mr. Ahrons in the June RAILWAY MAGAZINE, the others taking the numbers of 0-6-0 tank engines, built by Dübs and Co. in 1877, for the Glasgow, Bothwell and Hamilton Railway.

* * *

A much-needed improvement has been carried out at Temple Meads Station, Bristol. The footbridge between No. 1 and No. 4 platforms has been doubled in width, and an opening has been made in the wall near the present exit which forms another and more direct entrance

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and way out. There is a barrier through the centre of the bridge, and directions to passengers are posted, so that people may always pass in one direction. By this method the previous jostling and confusion arising from pedestrians not keeping the proper side is avoided. Later on some other improvements will be made. The widened and improved bridge was brought into use on July 10.

* * *

SUPPLEMENTARY to an answer given a RAILWAY MAGAZINE reader in the July issue, Mr. H. P. Hart states that the first station at Letchworth, Great Northern Railway, of a temporary nature, was opened April 15, 1905. The present substantial station was opened in 1913.

* * *

BY an error, the aerial photograph reproduced on page 45, July, RAILWAY MAGAZINE, was described as Redhill Station, South Eastern and Chatham Railway. The photograph really represents Earlswood Station, London, Brighton and South Coast Railway, where the Redhill and "Quarry" lines come together.

* * *

AT the recent Canadian Industries Exhibition at the Royal Agricultural Hall, Islington, N., the Canadian Pacific Railway had the whole of the entrance from the turnstiles up to the main hall itself. This is said to be the largest space ever taken by a single exhibitor at the Agricultural Hall—but then the Canadian Pacific Railway does things in a big way. In addition, this railway's Publicity Department took the King Edward Hall for a cinematograph display, and during the 12 days the Exhibition was running no fewer than 10,500 tickets were issued for the Canadian Pacific Cinema.

* * *

FROM North Wales, Mr. H. W. Comber has sent a photograph of a gradient post, showing an exceptionally low gradient *i.e.*, 1 in 6,600, and he wonders if any other RAILWAY MAGAZINE reader knows of a lower one in the United Kingdom. The post is just outside Rhuddlan station on the Vale of Clwyd branch of the London and North Western Railway.

CANADIAN PACIFIC RAILWAY.

Exhibit at Canadian Industries Fair, Royal Agricultural Hall, London, 1920.

* * *

SEVERAL Irish readers of the RAILWAY MAGAZINE have recently forwarded newspapers and press cuttings bearing on the position of railwaymen involved in the political troubles of Ireland. We are obliged by the courtesy. These are distressing times in the Sister Isle, and while, as a non-political periodical, we cannot take sides we sincerely sympathise with both railway workers and officers who find themselves entangled in quarrels not of

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their own making. We can but wish all those engaged in the Irish railway industry "a happy issue out of all their afflictions."

* * * *

THE Felix Hotel, Felixstowe, was formally taken over by the Great Eastern Railway on June 21, by Mr. Sidney Smith, the Hotels' Manager, and Mr. Thomas Chew, the Solicitor, on behalf of the Company. Various improvements are contemplated in due course at this popular hotel. Hard Tennis Courts are being constructed by the En-Tout Cas Co., which will be ready just as soon as the Grass Court Season is over. A very fine 18-hole Golf Links is under preparation and will be ready for playing in August, and is considered by experts as one of the finest seaside courses in England. In due course, although not just yet, a system of baths will be constructed adjoining the Hotel, and as the Great Eastern Railway will see that the service of trains with Breakfast, Luncheon, Tea and Dinner cars will be greatly improved, the future prospects of the Felix Hotel should be bright in the extreme.

* * *

"A Church under a Railway Junction" is mentioned by one of our readers, Mr. C. F. Klappet. It is situated directly under Gas Factory Junction, where the London, Tilbury and Southend section of the Midland Railway leaves the Great Eastern Railway between Burdett Road and Bow Road stations. Two of the arches have been rented for many years by Bromley Parish Church and fitted up for Mission purposes, the premises being partly on Great Eastern and partly on Midland Railway property. The latter portion of the arch is somewhat lower.

* * *

IT is difficult in these days of enforced economy to keep everything up to the mark; but the London "Underground" Electric Railways in their station efficiency competition have hit upon a very useful incentive to the spirit of "spit and polish." Each of the six "Underground" lines is to have its own Efficiency Challenge Shield, to be awarded at the end of every six months to the station staff which is adjudged to have achieved the best record of all-round efficiency during that period. In the awarding of the Shield everything will be reckoned which makes for efficient working, *e.g.*, courtesy and general conduct of staff; handling of ordinary traffic and special emergencies, such as signal failures, etc., platform, lift, and booking office service; tidiness of station premises; economy in stores; keeping premises clear of loafers; everything, in fact, which can assist smooth working and public comfort. This novel competition is arousing the greatest interest and rivalry among the station staffs of each line, and has already produced results very satisfactory, both to its promoters and to the travelling public. The Challenge Shield on each line will be prominently displayed, when awarded, at the winning station, and will carry with it a prize of £20 to be divided among the station staff.

* * *

QUEENSLAND has the greatest railway system in the Australian Commonwealth, the Government lines opens for traffic to date totalling about 6,000 miles. In addition to these there are 440 miles of railways owned by public bodies, open for public traffic also. The railways under construction include two very extensive schemes—the Great Western Railway and the Great North Coast Line. The former involves the building of 1,282 miles of line, and includes extensions from Westgate to Quilpie, Blackall to Yaraka towards Winderah, Winton to Springvale, and Duchess to Dajarra to Sulieman Creek. Those four extensions will be connected by a trunk line running north-west from Eromanga to Camooweal, on the border of the Northern Territory, and will open up large areas of land splendidly adapted for sheep and cattle raising. The total length of this line will be 1,335 miles. The Great North Coast Railway will, when the existing gaps are linked up, give a continuous line from Brisbane to Cairns, 1,040 miles in length. Practically all the country en route is suitable for close settlement. In addition to the above-mentioned lines, several are being laid into agricultural districts.

* * *

EXCEPT for Russia and Portugal, Spain is the only country in Europe that has not adopted the standard railway gauge of 4 ft. 8½ in. Proposals are on foot, however, for converting the gauge to this standard, so as to allow of through running with neighbouring states.

* * *

WE have to announce the retirement of Mr. Greensill Allen, the Estate Agent of the London, Brighton and South Coast Railway. Mr. Greensill Allen commenced his services with the company in May, 1873. He was appointed Assistant Estate Agent in 1885 and Estate Agent and Surveyor in April, 1899, which position he held until his retirement. Mr. Thomas J. Jones, the Assistant Estate Agent to the company since 1899, has also retired, after a service of 48 years. The directors have

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decided to divide the department into two parts, one dealing with rating and survey business and the other with estate and land business, and they have appointed Mr. Walter Blair the Rating Agent and Surveyor, and Mr. J. A. Pinfold the Estate and Land Agent, to take charge of the respective divisions.

* * *

IT has been arranged by the London, Brighton and South Coast Railway that the Brighton and the Dyke Branch Line which has been closed during the war shall be re-opened for traffic on Monday, July 26. This line will prove a boon to golfers who use the links adjacent to the railway, also to those visitors who enjoy rambles across the Sussex Downs.

* * *

THE daily service (Sundays excepted) between London and North Germany via the Great Eastern Railway's Harwich-Hook of Holland British Royal Mail Route, has been considerably accelerated by the arrangement of new connections from Rotterdam and Amsterdam. The journey to Berlin is now accomplished in 34 hours, and Hamburg in 36 hours. Leipsic 37 hours, and Dresden 39 hours. The boat train with vestibuled corridor restaurant cars attached leaves Liverpool Street Station at 8.30 p.m. Turbine steamers only are run between Harwich and the Hook of Holland. Passengers for South Germany and Austria can reserve sleeping car berths from the German frontier to Wurzburg by the connecting train from the Hook of Holland, upon application to the Continental Traffic Manager, Liverpool Street Station, London, E.C. 2.

* * *

IN connection with the Great Eastern Railway steamers between Harwich and Antwerp a special boat train has been arranged from Antwerp Sud Quai to Brussels Nord giving connections to all important towns in Belgium, and also to Cologne.

* * * —

AT the time of going to press with this issue of the RAILWAY MAGAZINE it is impossible to say precisely when railway fares will be increased and what the additions to the fares may be, but readers will perhaps have learned from the daily papers. On July 14 Sir George Beharrell, Director-General of Finance, Ministry of Transport, summarised the position thus:—"Increase fares or taxation—which is the least harmful? Extra expenses are not due to wages alone, but to the higher cost of wages and materials. If rates are not increased from August 1 and September 1 for passengers and goods respectively, the increases to meet deficiencies must be larger than at present proposed." Proposals, at the time of writing, are:—All passenger fares—ordinary, workmen's, season, and traders'—to be increased 100 per cent. above pre-war rates.

* * *

BRITISH passenger train mileage for the period January 1 to April 25, 1920, is found to be equivalent to about 80 per cent. of the mileage for the same period in the "boom" year of 1913. It is a figure which might be expected in view of the large increase in the percentage of locomotives under and awaiting repair. As it is known that more people are travelling now than in 1913, it follows that trains are better filled. The deceleration of passenger services permits trains being made heavier in their composition, thus giving increased carrying capacity.

* * *

EXAMINATION of the new main line services which have come into operation on eleven of the British railways in July shows an increase of 4 per cent. as compared with the passenger train mileage on March 1 last. For the purpose of this calculation the additional passenger trains which have been allotted to local and suburban services have been excluded.

* * *

ON Saturday, July 10, a party of twenty-five members of the Railway Club paid a visit to the Channel Ferry at Richborough. This expedition proved to be one of the best outings that the Club has organised. The party went down by the 1.15 p.m. from Cannon Street to Ramsgate Harbour, where a motor char-à-banc was waiting. The weather was fine, with the exception of a very little rain, so ample opportunity was afforded for viewing the general lay-out of the yards and piers and inspecting the many curious types of rolling-stock in the sidings. The party were conducted over the various repair shops and also over one of the ferry steamers. This last proved most fascinating, the constructional detail of the wonderful craft exciting warm admiration. The working of the hinged platform, by which vehicles, both road and rail, are marshalled on the ferry, was also shown. After a busy but enjoyable time the Club party returned to Ramsgate, and then on to London by the 7.45 p.m. train. The South Eastern & Chatham Company kept admirable time both ways, with heavy trains, which gave those who follow locomotive performance an excellent opportunity to log two pieces of very fine work. Those who took part in

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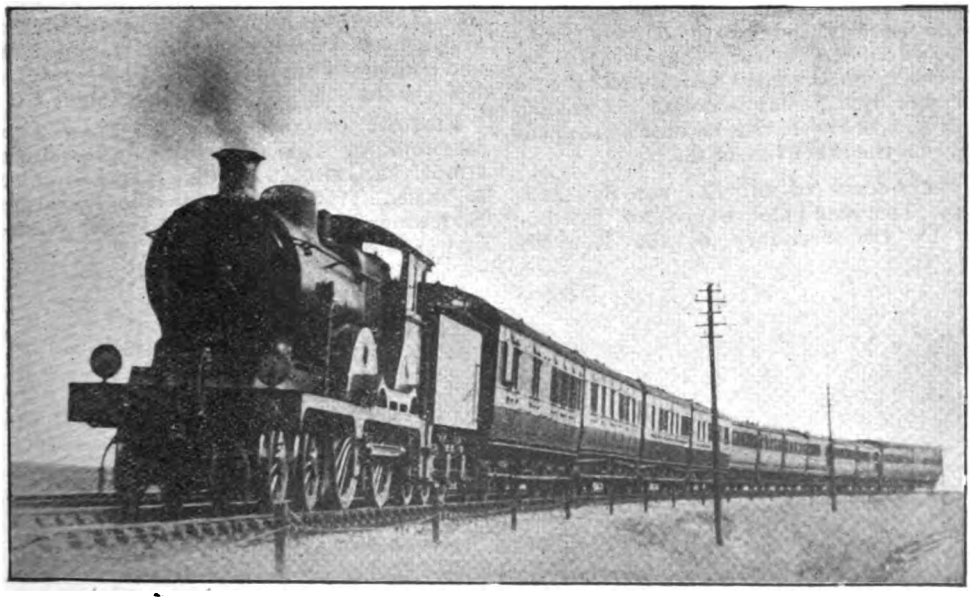
this visit expressed their deep gratitude to the representatives of the South Eastern and Chatham Railway and of the Ministry of Munitions for the great trouble they took to make the inspection interesting.

* * *

AN excellent holiday manual for 1902 has been issued by the Lancashire & Yorkshire Railway. Well printed and profusely illustrated, it merits considerable appreciation on the part of those who desire a vacation in one of the many districts served by the company, whose main line connects the West and East Coast of England. Readers contemplating a visit to the Isle of Man, and those—particularly North countrymen—who desire to obtain information concerning week-end tours to the battlefields in Belgium, should secure a copy of the book. For information relating to passenger train services application should be made to Mr. Ashton Davies, Superintendent of the Line Lancashire & Yorkshire Railway, Manchester.

* * *

THE new series of four-cylinder "Claughton" class locomotives, referred to in the July RAILWAY MAGAZINE (writes Mr. C. Williams) has now been turned out and allocated to No. 15 (Crewe) shed. A further series of similar engines is expected in service shortly, the first two of which will be Nos. 484 and 1407. No. 2 *Simoom* ("Precursor" class) has been rebuilt with extended smokebox and superheater, and is now similar to the "George the Fifth" class A further two four-cylinder compound mineral engines have been simplified and superheated, Nos. 1308 and 1889. The latter was one of those which Mr. Whale altered by the addition of a small pair of wheels at the leading end, but as now converted this has been dispensed with. Twenty-three additional 2-8-0 mineral engines (R.O.D. type) have been received—15 from the Lancashire and Yorkshire Railway, six from the South Eastern and Chatham Railway, and two from the London and South Western Railway. These are now numbered in the London and North Western Company's stock as follows:—*ex* Lancashire and Yorkshire Railway, R.O.D. Nos. 1629, 1654, 1655, 1673, 1707, 1743, 1815, 1821, 1823, 1829, 1840, 1842, 1844, 1851, 1986—London and North Western, Nos. 2956–2970; *ex* South Eastern and Chatham Railway, R.O.D. Nos. 1671, 1679, 1682, 1706, 1717, 1720—London and North Western, Nos. 2971–2976; *ex* London and South Western Railway, R.O.D., Nos. 1738, 2121—London and North Western, Nos. 2977 and 2978. In connection with those taken over from the Lancashire and Yorkshire Railway, it may be noted that all have the coat of arms of that company affixed on the side panels of the cab. By the withdrawal of No. 1407, Mr. Webb's 4-6-0 four-cylinder compound goods class is reduced to one solitary engine, viz., No. 2059. Maybe this, too, will have been summoned to the slaughter ere these lines appear in print.



GREAT EASTERN RAILWAY.

An Express train on Clapton Curve. 4-4-0 Locomotive, No. 1858.

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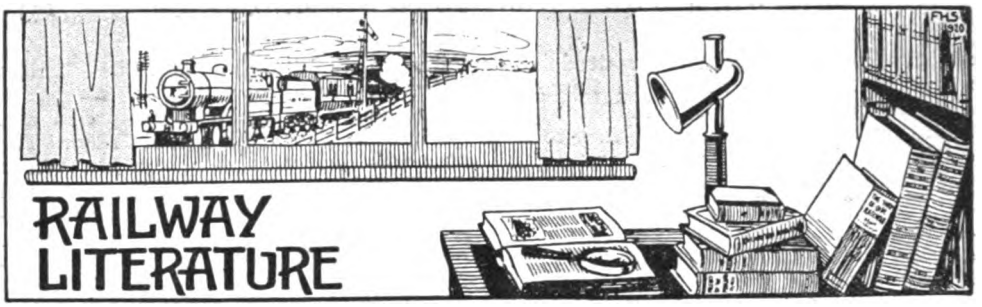


WHO'S WHO IN ENGINEERING, 1920-21: Edited by John Ed. Sears, C.B.E., M.A., Assoc.M.Inst.C.E. Price 25s. net. [London: The Compendium Publishing Co., 93 and 94, Chancery Lane, W.C.2.] Of practical utility as well as of biographical interes, this volume is a development of the "Who's Who" principle on practical lines, and contains original features. The work has been confined to British engineers and engineering firms and institutions. The book within its 426 pages includes particulars of Engineering Institutions and Societies, centres of technical engineering training, a classified list of engineers, an index of manufactures, trading and research associations, associations of employers and of employees, engineering journals, and numerous other allied features.

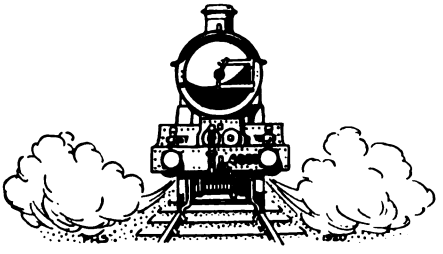
OUR BANKRUPT RAILWAYS. By Roland Belfort. [London: "Financial Empire," 31, Finsbury Square, E.C. 2. Cloth, 62 pp., 6s. net.] Save in invective, this book is a very poor production. What the author lacks in knowledge and understanding of the railway industry and the people employed in it, he endeavours to balance by extravagant language. Mr. Belfort should remember that a man is not of necessity a fool, rogue, or Bolshevist, because he happens to live on the other side of the street.

FREE ACCESS TO THE SEA FOR SWITZERLAND. This pamphlet, issued for distribution by the Secretary of the Nouvelle Société Helvétique, of 28, Red Lion Square, London, W.C.1, pleads the cause for a free Rhine in the interests of the Republic.

TALES FOR THE TRAIN. By G. Huddleston C.I.E. (late General Traffic Manager, East Indian Railway). Price One Rupee. [G.I.P. Railway Magazine Office, India.] These short stories have been written since retirement as a pastime. Twelve in number, they form a very entertaining budget. Several of them deal with railway people or embody railway adventures. Most authors who attempt railway stories lack real railway knowledge, but Mr. Huddlestone has a distinct advantage here, for he has been associated with railway activities nearly all his life, and he possesses the pen of a ready writer. The stories are well worth reading. Had not the author been a busy and capable railway officer he could easily have earned a great name and considerable fame as a story writer.

INSTITUTION OF CIVIL ENGINEERS: ABSTRACTS OF PAPERS, ETC., APRIL, 1920. Supplementary to the minutes of proceedings of the Institution of Civil Engineers the abstracts of papers in scientific transactions and periodicals are now published separately. No. 3 of the new series is now available.

EPITOME OF THE PURPOSE, PLAN AND METHODS OF THE CARNEGIE ENDOWMENT FOR INTERNATIONAL PEACE. This pamphlet is issued gratuitously by the Carnegie Endowment for International Peace, Washington, U.S.A.



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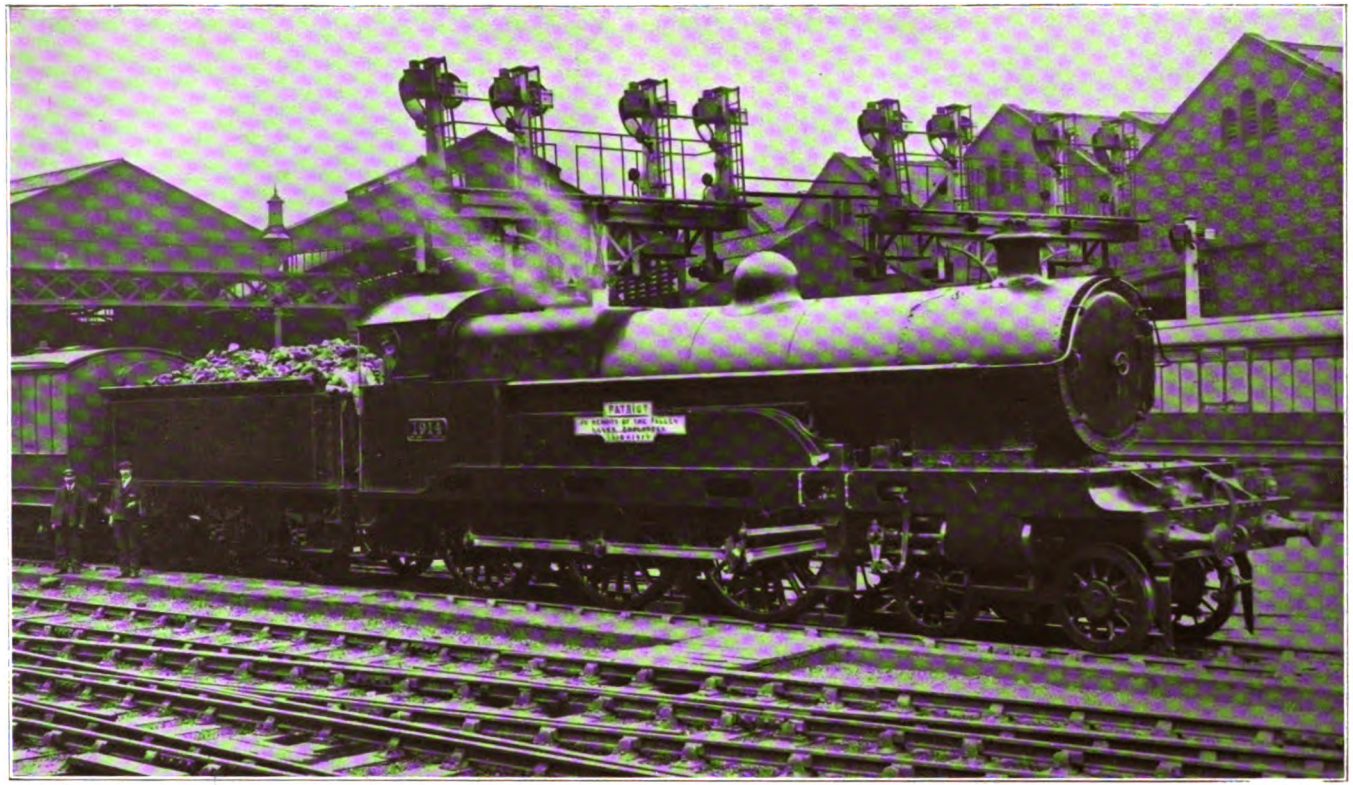

 [*Topical.*

LONDON AND NORTH-WESTERN RAILWAY MEMORIAL LOCOMOTIVE.

This engine, specially numbered **1914**, and named "PATRIOT," bears also the inscription shown in memory of L.& N.W.R. employees who fell during the Great War. It is of the Four-Cylinder "Claughton" Class.

Designed by Mr. C. J. BOWEN COOKE, C.B.E., Chief Mechanical Engineer, and built at Crewe Works.

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Photo.] [*J. F. Gairns.*

LIVERPOOL STREET--LOUGHTON TRAIN ENTERING WOODFORD STATION.

2-4-2 rebuilt tank engine No. 143.

The Loughton and Ongar Branch of the Great Eastern Railway.

By G. W. J. POTTER.

ESSEX is popularly supposed to be flat, desolate, and uninteresting, and if a traveller makes his first acquaintance with it by a journey up or down the River Thames he doubtless sees a somewhat monotonous shore line with slopes only gradually tending upward as they recede inland. But let him penetrate into the county, preferably by road or footpath, and he will discover much pretty scenery, and will meet with many steep though short hills. Most of the railway lines lead through very pleasant and pastoral country, but the writer makes bold to say that among the numerous suburban lines of London, few will take a higher place for prettiness of scenery and outlook as seen from the carriage windows than the Loughton and Ongar branch of the Great Eastern Railway. For a considerable portion of the journey the route lies through residential districts, yet these are well wooded, and the traveller does not have the feeling that all the available land has been completely swallowed up by the erection of modern houses. Beyond Loughton the suburban area is left behind, and henceforth the train traverses pastures and cornfields interspersed with woods and coppices.

The man who travels daily to and from London is in many cases so used to his forest surroundings, that he pays but slight attention to the beauties of nature daily displayed before him with lavish hand in ever-changing colours and tints as the seasons melt one into another. It is not so with the stranger and the newcomer, and a trip down the line, especially in spring or early summer, is usually sufficient to convince the onlooker that there is beauty indeed in Essex.

The branch line from Stratford to Loughton was constructed by the old Eastern Counties Railway and was opened for traffic on August 22, 1856, or nearly six years before the inauguration of the Great Eastern Railway. The only other branch lines in the London district then owned or worked by the Eastern Counties

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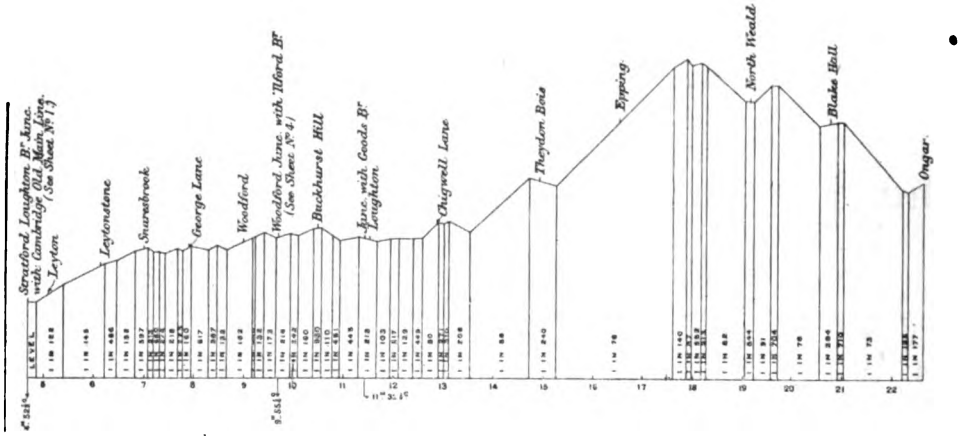
Railway were the Fenchurch Street to Blackwall (opened 1840), Stratford to North Woolwich (opened 1847), the Northern and Eastern Railway from Stratford to Tottenham, Angel Road (opened to Broxbourne, 1840) and Angel Road to Edmonton and Enfield Town (opened 1849). This latter branch was only a single track and all trains from Shoreditch to Enfield Town travelled by way of Old Ford (now Coborn Road), Stratford, Lea Bridge and Tottenham, for the present-day route from Bethnal Green Junction, through Hackney Downs Junction and Seven Sisters was not constructed until 1872 and Liverpool Street Station in February, 1874.

This may account for the fact that until recently the Loughton service has always been regarded as standing somewhat apart from the others. Fast trains were a speciality of the branch, and new types of rolling-stock usually made their first appearance on this section of the suburban district. Other factors there were, of course, such as the tapping of a fairly wealthy residential district, and the attractions of Epping Forest for holiday-makers and excursionists.

As far back as 1846 powers had been obtained by the Eastern Counties Railway to construct a branch line to Epping, but this scheme was not carried out. Later on a railway was authorised from Stratford to Loughton, leaving the main line of the Northern and Eastern at a point about half a mile north of Stratford Station. This was duly constructed, and stations at Leyton, Leytonstone, Snaresbrook, George Lane, Woodford, Buckhurst Hill, and Loughton were provided. The continuation of the line to Ongar was opened for passenger traffic in April, 1865.

At various times proposals have been made to extend the line to either Chelmsford and there join the main line, or in a northward direction to tap the agricultural district of the Roothings and the Bishop's Stortford–Dunmow–Witham section, but nothing has come of these schemes.

No new stations have been opened on the line, but all those between Leyton and Loughton have been rebuilt or improved in one way or another. The standard train of eight bogie vehicles can be accommodated at any of the platforms easily, and in most cases with room to spare.



GRADIENT PROFILE, LOUGHTON AND ONGAR BRANCH, GREAT EASTERN RAILWAY.

The line, being built in days when the company was not overburdened with wealth and had little money to spare, follows the contour of the ground closely, hence level crossings are numerous, and these naturally have to be considered in the working of the service. Leyton has road bridges at each end of the station, so the traffic is not hindered there in any way. Leytonstone has a level crossing at the southern or London end of the station, and a heavy road traffic is always in evidence, but a wide subway for pedestrian traffic is provided. In the olden days the down platform was on the southern side of the crossing and the up on the northern. This arrangement was also to be found at Buckhurst Hill station.

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In other places the usual plan was to place the platforms on either side of the public road so that the actual crossing was always at the rear of the up and down trains when they were standing at their respective platforms or the reverse of that at Leytonstone. It is now, however, customary to place the platforms opposite each other whenever possible.

To assist in coping with the heavy business traffic in the mornings and evenings a signal-box known as Leytonstone South was erected on the London side of Leytonstone. This slight shortening of the section and the installation of an advanced starting signal at Leytonstone enabled trains to be passed through at a somewhat quicker rate than formerly.

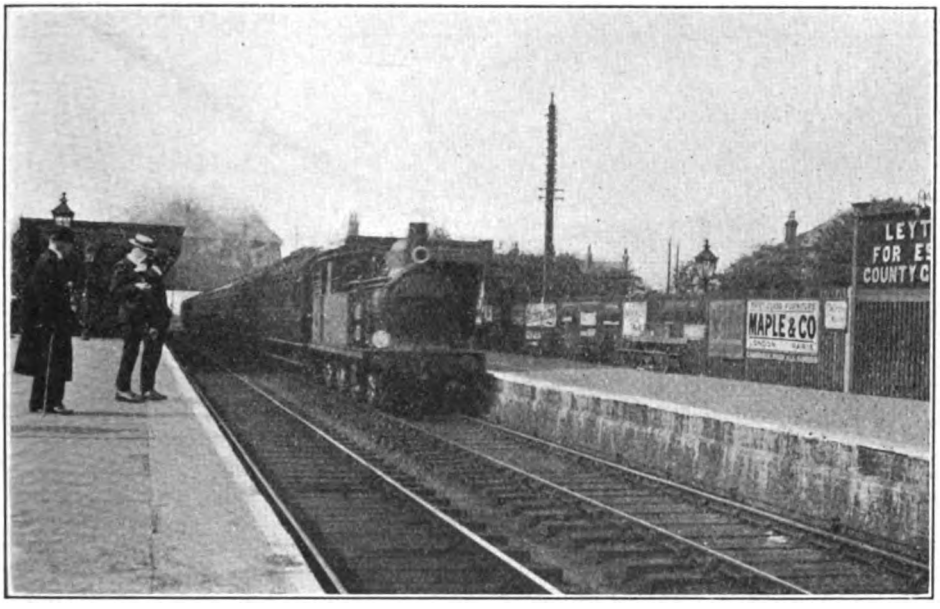

Photo.] [*J. F. Gairns.*

FENCHURCH STREET--LOUGHTON TRAIN (EMPTY) PASSING LEYTON STATION.

2-4-2 tank engine and train of suburban bogie coaches.

Running through a very short cut and cover tunnel—the only one on the line—Snaresbrook Station is reached, and the line passes over the road by a bridge. The next road, Eagle Lane, is crossed on the level, and here is installed a signal-box with control of the gates. This is under the charge of the stationmaster at George Lane, the station for the popular residential district of South Woodford. Here is another level crossing, and again a heavy traffic is usually in evidence. To minimise the delay caused to foot-passengers by the closing of the gates across the road for the passage of a train a foot-bridge has been provided. This helps matters but is not of the same value as a subway as at Leytonstone, where conditions were more favourable. Woodford, the next station, has another level crossing at the northern end. Passing the remains of the old down platform and crossing, on the level, the foot of the steep street at Buckhurst Hill, the quiet station of that name is reached.

Loughton was formerly a terminal station, and parts of the station buildings and the old turntable, a very small affair, are still in position. The extension to Ongar leaves the original line about two train lengths from the dead end and curves away in a north-easterly direction to Chigwell Lane. The old line has been converted into sidings for the reception of the empty and spare trains employed on the branch, and usually there is a considerable amount of shunting going on there.

A large proportion of the trains terminate

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at Loughton, and those which go further usually comprise two bogie-coaches only, the remaining six being left behind. In the days of four-wheeled stock the standard train was 15 vehicles and the Ongar portion was then five coaches. Some of the Epping trains, chiefly those terminating there, are made up to the maximum formation, as they can be dealt with at the stations of Chigwell Lane, Theydon Bois, and at Epping station, where the platforms are of sufficient length. From Epping the line is single, and the stations of North Weald, Blake Hall, and Ongar are small and unable to accommodate long trains, though quite able to supply the needs of the district.

Although the Loughton branch is essentially a suburban passenger undertaking, there is, nevertheless, a heavy goods and agricultural traffic over it, and an immense quantity of milk is brought in daily from the farms in the Epping and Ongar districts.

At Woodford several sets of metals have been laid down on the up side for storage of trains, and a bay line has been provided alongside the up platform. For many years after its opening the Loughton line was principally served by trains running to and from Fenchurch Street, with very few through trains to Liverpool Street. In fact, all the fast trains ran to and from the former station. Gradually, year by year, the proportions have changed, and though there are still some fairly good Fenchurch Street trains, the best services are now given from and to Liverpool Street.

Closely connected with the Loughton branch is the Woodford and Ilford line, which was opened in 1902. This branches away from the Loughton line just north of Woodford, and curving to the east passes through Chigwell, Grange Hill, Hainault, Fairlop, Barkingside, and Newbury Park stations, reaching the Colchester main line near Seven Kings station. Junctions are laid in here in both directions; but that on the London side is the one that is chiefly used. In pre-war days excursion trains to Southend from the Loughton line and certain special trains were run over this route; now only stock trains and main-line goods trains are sometimes worked by the eastern junction. A circular or roundabout service of passenger trains from Liverpool Street via Wood-

Photo.] [*J. F. Gairns.*

GENERAL VIEW OF WOODFORD STATION.

Showing carriage sidings to the right, goods train shunting to the left and light engine passing station on up through line.

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ford, Fairlop, and Ilford to Liverpool Street and *vice versa* was a feature of the original installation, but through trains now perform this journey only morning and evening and on Saturday afternoons. At other times a shuttle service at infrequent intervals works between Woodford and Ilford, and certain of the down trains to Ilford via Manor Park are continued to Newbury Park, Barkingside, and Fairlop. Likewise, some of the trains run via Woodford as far as Chigwell, Grange Hill, or Fairlop. Hainault station has been closed and it is doubtful if it will be again opened. Immediately after leaving the Loughton line the branch

Photo.] [*J. F. Gairns.*

CHIGWELL STATION—FAIRLOP AND ILFORD LINE.

makes its way by means of a high embankment across the flat valley of the River Roding, which in rainy seasons is often the scene of extensive floods. But in spite of this the district is somewhat hilly and the scenery attractive. After leaving Fairlop the line is carried through a hill by a tunnel 260 yards long.

Unfortunately this line has not, up to the present, proved the financial success that was expected, probably owing to the difficulty in purchasing land for building; but it is to be hoped that this difficulty will be overcome in the near future as the whole district is admirably suited for development. The stations are well-built and convenient, and rank among the finest on the Great Eastern system. There are, however, too many of them, but this was a stipulation by the Government; heavy expense is also incurred owing to the continual slipping of the earth (London clay) in the cuttings and embankment which seem to resent remaining at rest for long together. Buildings are, however, springing up in the neighbourhood of Newbury Park and Ilford.

The Woodford and Ilford line should form, if properly laid out, a convenient route for goods traffic to and from the Colchester and Cambridge main lines, and the two huge sorting sidings at Goodmayes and Temple Mills. A considerable part of the benefit is lost because no direct route has been provided between Leyton and Temple Mills, neither is there a through connection for trains coming from Victoria Park, Channelsea Junction, and the line skirting the northern side of the engine sheds at Stratford to the Loughton branch. Each of these routes involves a shunt, and in some cases a change of engine to the other end of the train, and it is really very curious that the authorities have not gone to the little trouble and expense required by laying

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in the necessary junctions. No land would have to be purchased as all alterations would be on property already owned by the company.

In normal times the Loughton line is a very busy section of the Great Eastern Railway, and during the summer months numerous trains are filled with children from schools, churches, chapels, institutions, &c., going down to Buckhurst Hill, Loughton, or Theydon Bois for the purpose of spending a happy day in the Forest. From Leytonstone to Epping the railway is seldom far away from the eastern borders of Epping Forest, so that rambles, long or short, in its leafy and picturesque glades, can easily be planned and carried out, and with the knowledge that a frequent service of trains is always within easy reach of the rambler.

Ongar, or Chipping Ongar, to give it its true title, is well worth a visit for its own sake, it being a quaint old market town, quiet and picturesque, in the midst of delightful pastoral country. It is also the starting point for visiting Greensted Church, one of the most remarkable ecclesiastical buildings in the world. The walls of the nave are of well-preserved timber, being composed of the trunks of large oak or chestnut trees, split in two, roughly hewn and set upright beside one another, their bottoms being let into a sill and their tops into a wall-plate. Although it has been several times restored, it is believed to be the original structure erected as a temporary resting-place for the body of King Edmund on its way from London to Bury St. Edmunds in 1013. The building is very tiny, being only about 30 ft. by 14 ft.

But to return to the railway: the present-day train services are mainly worked by 2-4-2 tank engines, though occasionally some of the 0-4-4 engines of the "1100" class may be seen in the district and now and then a 0-6-0 tank engine.

A set train comprises eight bogie coaches, the third and second-classes seating six and the first-class five a side. Trains composed of four-wheeled stock are not so frequently seen as formerly, and six-wheeled vehicles have always been something out of the common.

Photo.] ONGAR STATION. [*F. J. Mott.*

The Terminus of the Branch.

As far as Chigwell Lane the signals are worked under Sykes' lock and block apparatus. the efficiency of which is a striking tribute to the inventive genius of the engineer whose name it bears.

Upon referring to the gradient profile it will be noticed that the steep bank at Epping culminates about half-way between there and North Weald. This is one of the highest points on the Great Eastern Railway, being about 340 ft. above ordnance datum (while the height at Liverpool Street is only 31 ft), and is only surpassed by the company's light railway from Elsenham to Thaxted, which in some parts is nearly 100 ft. higher.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN.
A.M.Inst. T.

Photo.] [*A. Langmuir*

HIGHLAND RAILWAY.
Southbound Train leaving Newtonmore.
4-6-0 engine, No. 53, "Clan Stewart."

IN view of the detail in which "Voyageur" has dealt with the "Summer Train Services of 1920" elsewhere in the present issue, it is not necessary for me to do more than draw brief attention to certain special features connected with them. By far the most enterprising programme is that of the Great Western Railway, introducing as it does new non-stop runs to Torquay and Worcester from London, and also from Newton Abbot to Paddington. Owing to a severe slack for engineering works in progress between Dawlish and Teignmouth, all expresses are allowed 2 min. extra on their journeys between Exeter and Newton Abbot, and this accounts for the down "Riviera" passing Exeter 1 min. earlier than before, and reaching North Road a minute later, while the up "Limited" has both minutes cut from its schedule between Exeter and Paddington, and becomes the fastest train over this 173·7 miles' course. Non-stop running is resumed between London and Bristol by the 11.15 a.m. *ex* Paddington and the 5.10 p.m. *ex* Temple Meads, stops at Bath in the former case and Reading in the latter being replaced by "slips" in each instance. Similarly the 6.30 p.m. down now slips at Chippenham and so reaches Bath without intermediate stoppage. The early morning train from Fishguard is made into a kind of "relief" to the the 8.35 a.m. from Swansea to London as from Landore onwards, leaving the former to make its old 160 min. run from Newport to Paddington; the Fishguard train, following, makes a fast run from Badminton to Reading, 64 miles, in apparently 70 min., but the actual working time is a minute more.

A correspondent has sent me a very carefully compiled table of runs on the Great Western Railway at 50 m.p.h. or over, which I hope to publish in an early issue, after verifying the times; it includes a total of 99 such runs, and a total mileage at 54 m.p.h. or over, exceeding 700 miles, which result, as my friend remarks, "is remarkable, and few other railway systems in the world can be showing such a service at the present time."

The Great Eastern programme is also an excellent one, with the resumption of something approaching the pre-war "Norfolk Coast Expresses," at 12.25 p.m. from Liverpool Street, calling first at North Walsham, 130·2 miles, in 170 min.

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from London, or 12 min. more than the 1914 allowance. The up train is allowed 173 min. Overall time to Cromer is 18 min. over the 2 hours 55 min. of 1914, and 20 min. more by the return train, and the loads are somewhat lighter, as the Overstrand portion of the old 1 p.m. down is carried by the 12.33 p.m. from Liverpool Street. On the Yarmouth route non-stop running between Liverpool Street and Beccles is resumed by the 9.55 p.m. down, and the 1.0 and 4.22 p.m. up from Yarmouth, all three trains carrying Lowestoft portions, and the overall times varying speaking, intermediate running times are eased somewhat from those of the last few months, the best time to Ipswich being now 88 min. (5.23 p.m. down, also 12.25 p.m., passing), and in the reverse direction 89 min. (11.30 a.m. and 5.55 p.m. into Liverpool Street); the down 8.30 p.m. boat express passes Colchester in 64 min., however, while the smart time of 58 min. up from Mark's Tey is retained by two trains. The London and South Western practice of using incoming expresses to form outgoing trains shortly afterwards is now followed at Liverpool Street in a striking degree—in fact,

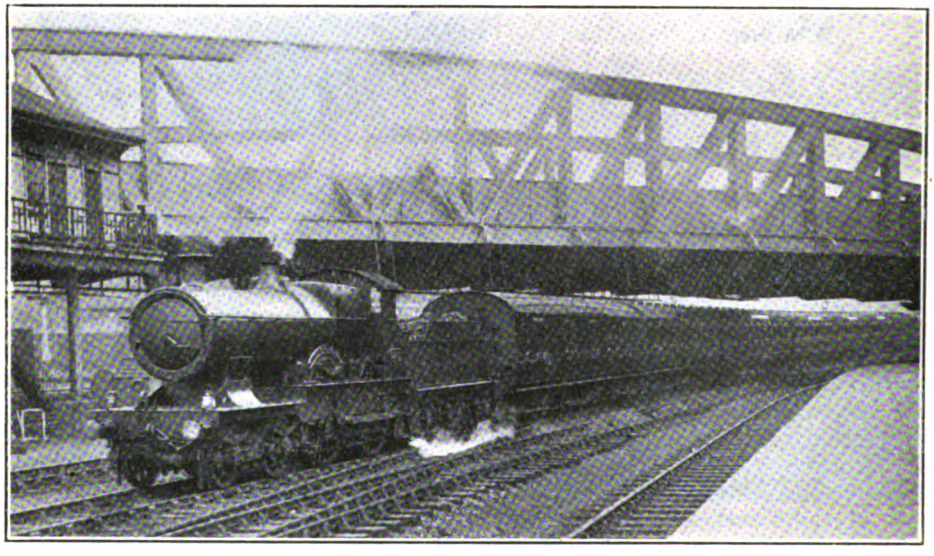

Photo.] GREAT WESTERN RAILWAY. [*F. E. Mackay.*

3.25 p.m. down Birkenhead train leaving Paddington. 4-4-0 engine, No. 3436, "City of Chester."

from 3 hours exactly to 3 min. less by the 9.55 a.m. down. The non-stop run of the 5.30 p.m. *ex* Liverpool Street to Thorpe-le-Soken is shared by a new train from London at 1.30 p.m., the 100 and 101 min. times respectively of these two trains to Clacton being superior to the best time (103 min.) in force before the war. Cambridge also gets a non-stop train once again by the restoration of the 11.25 a.m. summer express from Liverpool Street to Hunstanton.

It is impossible to detail all the changes, but in all the circumstances the summer service provided by the Great Eastern Railway is an enterprising one. Generally the present carriage working on the Great Eastern Railway has been planned with the most remarkable ingenuity, and accounts, *inter alia*, for the fact that 16 sets of restaurant cars are able to keep no less than 36 trains supplied with restaurant car facilities daily. The suburban developments have been dealt with last month in considerable detail, and I must not be tempted to expatiate on them as I should like; suffice it to say that 48 16-coach trains in one hour over one pair of lines must be the most amazing service ever yet planned with steam traction. It is very improbable, indeed, that any other train service

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anywhere has received the vast amount of preliminary attention and preparation in detail as has been devoted to this development in the Great Eastern Railway suburban area.

There are no very startling alterations on the London and North Western Railway. A new express to the North Wales Coast is provided at 10.40 a.m. from Euston, and is "raced" on Saturdays, while it is calling at Northampton and Rugby, by a special train to the same destination at 10.55 a.m., stopping first at Crewe. The 11.5 a.m. to Manchester carries a Windermere and noteworthy occasional run in their current time-table, an express being scheduled to cover the 75 miles from Whitchurch to Machynlleth without a stop. Another innovation on the Cambrian line is the complete through restaurant car express from Paddington to Aberystwith, the routing of Great Western coaches from London to Barmouth and Pwllheli *via* Welshpool also being decidedly novel.

On the Lancashire and Yorkshire Railway, beyond the running of the special summer expresses from all parts of the system to Southport and Blackpool, the principal alteration is the material

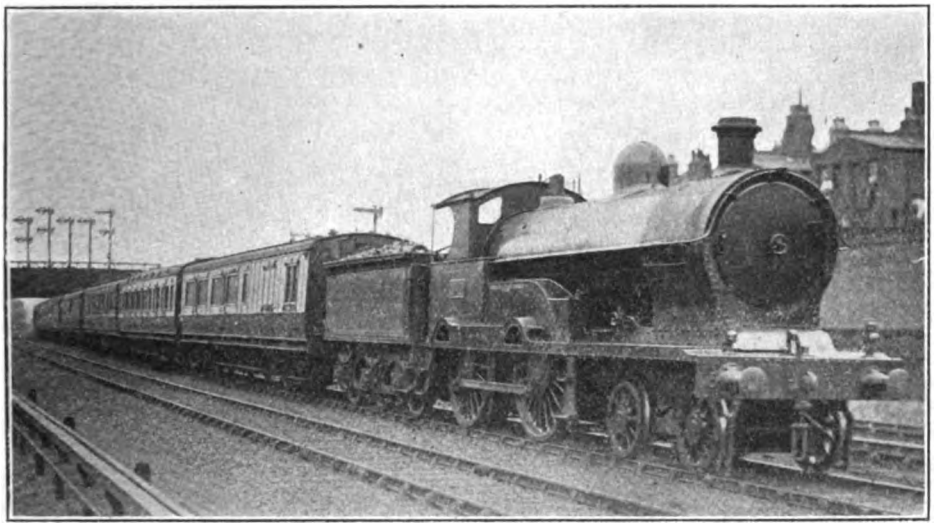

Photo.] LONDON & NORTH WESTERN RAILWAY. [*F. E. Mackay.*

Up North Wales express. 4-4-0 superheater engine, No. 1799, "Woodcock."

Keswick portion, as previously, and now stops at Bletchley, to give connection from Oxford and Cambridge (instead of the "change guards" stop at Rugby), so having a new 111.4 miles' non-stop run from Bletchley to Crewe. Special seasonal trains run to Blackpool and the North Wales Coast from various directions, the most notable run without intermediate stop being from Wolverhampton to Prestatyn, 87¼ miles, at 12.35 p.m. The North Staffordshire Company work their Llandudno express through from Derby to Chester this year, not calling at Crewe on the forward journey, and the Cambrian Company, also, is working into Shrewsbury. The latter, by the way, have a acceleration of the morning luncheon car express from Liverpool to York by the omission of all stops between Manchester and Wakefield, and its extension as a through train to Newcastle over the North Eastern Railway. A fast York portion is also carried again by the Zeebrugge boat express (2.0 p.m. from Liverpool) as far as Wakefield.

One is glad to welcome once more on the Great Central Railway one of the most important of all cross-country expresses—that from Barry to Newcastle. This year the train begins its journey at Swansea, and is diverted *via* the Barry route from Bridgend to Cardiff; after that the usual course is followed *via*

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Chepstow, Gloucester, Cheltenham Banbury, Leicester, Sheffield and York It is a truly artistic touch that makes both north-bound and south-bound trains take exactly the same overall time to the very minute—11 hours 7 min.—but the running is a little below the pre-war standard of speed. In particular, over 2½ hours from reaching York to arriving at Newcastle, 80½ miles, is a poor figure, as also the almost similar time to clearing York on the south-bound journey.

Among North Eastern alterations the most interesting is the further acceleration of the 5.30 p.m. out of King's Cross to a 47 min. run over the 43.8 miles from Clifton Junction to Darlington, and the omission of Durham, the arrival time on Tyneside now being 11.5 p.m. All current North Eastern Railway express times, by the way, are slightly increased in virtue of the stone ballasting now being carried out between Ferryhill and Durham, and between Morpeth and Alnmouth, in addition, of course, to the "pitfall" allowances between Ferryhill and Newcastle.

The London and South Western Railway has not a great deal to offer in the way of increased speed; the 11.30 a.m. *ex* Waterloo is accelerated to a non-stop Southampton run in the usual 103 min. schedule, and calls thence only at Christchurch and Boscombe to Bournemouth. Some of the up trains are slightly expedited, there being now three 85 min. non-stop expresses from Winchester to Waterloo, while the 7.20 p.m. from Bournemouth runs the 48 miles from Basingstoke to Waterloo in 58 min., average 49.7 m.p.h. Up from Salisbury, too, three trains are now cut down to a 104 min. run to town. A very desirable improvement is the separation of the two main portions of the 10.50 a.m. down into two "hourly" trains, one at 10 a.m. for Padstow, and the other at 11 a.m. for Sidmouth and Ilfracombe, replacing the collection of expresses which used to leave at the latter hour. Thus the west of England service now becomes systematised, like that to Bournemouth, fast trains leaving London at 8, 10 and 11 a.m., and 1, 3 and 6 p.m. Three non-stop runs are now in force between Salisbury and Exeter, one in each direction being performed by the through restaurant car express—another excellent innovation—which runs daily between Portsmouth,

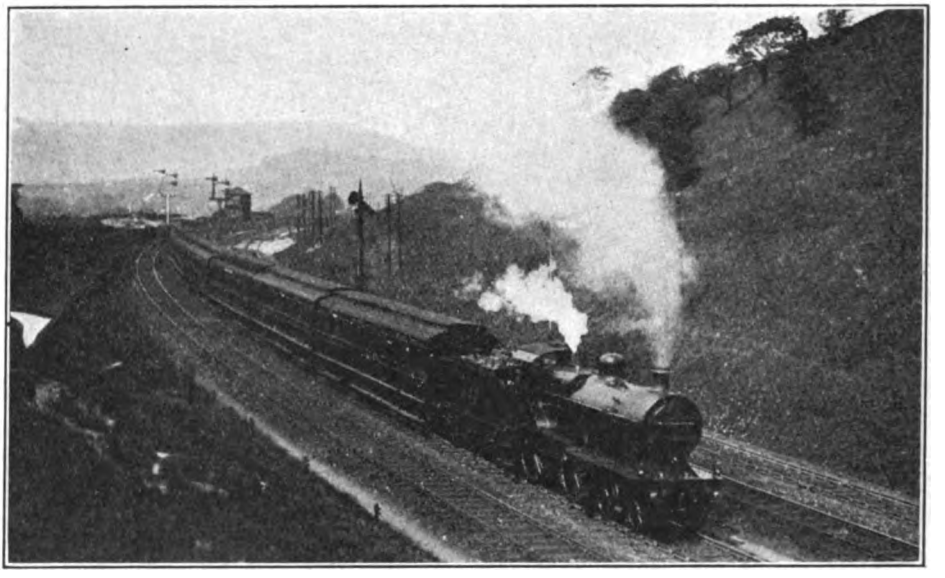

Photo.] MIDLAND RAILWAY. [*W. H. Whitworth.*

Manchester–London express near Bugsworth. Rebuilt superheater 4-4-0 engine, No. 447.

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Southampton, Salisbury, Exeter and Plymouth.

For details of a somewhat astonishing railway development over the August holiday we are indebted to no less redoubtable a journal than the *Daily Telegraph*. "At Euston," we read, "perspiring humanity was squeezed to suffocation in all the trains that went to North Wales and Scotland, and also those to Bournemouth, Swanage, Padstow and other watering places." Presumably there was too much of a rush at Waterloo to accommodate all the passengers to the last-mentioned resorts. One would be interested to learn the route followed by these North-South-Western expresses—had the statement any foundation in fact!

In turning to performance, I want first to correct a misleading impression which I may have given in the July issue in regard to current Midland running. Evidently the losses of time to which I referred were those which must inevitably be associated with the introduction of a much accelerated time-table, as since then every experience I have enjoyed has been excellent. So I propose, while the memories of these runs are fresh in mind, to describe them forthwith, and my excuse for dealing so soon again with Midland performance must be the very long period during the war when no Midland runs appeared in these columns at all.

I will start at the southern end of the system, with two runs on the 3.20 p.m. express from St. Pancras to Leeds. On the first we were hauled by the rebuilt superheater 4-4-0, No. 562, and as this is a Class 2 engine, our 31 axle-load of 208 tons tare was 8 tons above the maximum for this timing from St. Pancras to Kettering, and 18 tons above the figure thence to Nottingham. But we kept very good time. On the second occasion our engine was a Class 3 4-4-0, No. 717, superheated, and the load was only 7 "eights," 193 tons empty and 205 tons full (against No. 562's 220 tons gross). Banked in rear from the start, the times to Kentish Town were 3 min. 50 sec. and 4 min. 25 sec. respectively; after that No. 717 had a bad p.w.r. check through Haverstock Hill Tunnel, so taking 14 min. 20 sec. to Hendon against 562's 12¼ min., and 21 min. 55 sec. against 19¼ min. to Elstree summit, where the minima were 39 and 44 m.p.h. No. 562 touched 64 m.p.h. at Radlett and No. 717 65 m.p.h., the two trains passing St. Alban's in 27 min. 35 sec. and 30 min. 5 sec. Now the latter engine began to "get a move on," covering the 10¼ miles on to Luton in 11 min. 35 sec., as compared with 562's 12 min. 50 sec., the minima at Sandridge being 39½ and 44½ m.p.h., while 717 touched 66 m.p.h. beyond Harpenden. High speeds were run between Luton and Bedford, No. 562 taking 18 min. 10 sec. for the 19½ miles, with maxima of 72½ m.p.h. at Flitwick and 75 before Bedford, while No. 717 covered the distance in 17 min. 25 sec., with two sustained speeds of 76½ m.p.h. Total times to Bedford were thus 58 min. 35 sec. and 59 min. 9 sec., or 57 min. net in the latter case. Up to Sharnbrook summit No. 717 naturally had the best of it, covering the 10 miles from Bedford to mile-post 59¾ in 11 min. 35 sec., with a minimum of 34½ m.p.h., against 13½ min. and 28 m.p.h. So the former passed Wellingborough in 76¼ min., and running under easy steam thence reached Kettering in 84 min. 25 sec. (net time, a little under 82½ min.), whereas No. 562 took 77 min. 40 sec. to Wellingborough and 85 min. 40 sec. to Kettering. Schedule is 86 min., so both engines were well on time.

In consideration of the intermediate grading, the allowance of 61 min for this train on to Nottingham (51½ miles), is one of the stiffest at present operating on the Midland, but both engines maintained it without difficulty. No. 562 covered the 7½ miles to Weldon, commencing with ½-mile up at 1 in 132, and including also four ascending miles at 1 in 160–176, in 12 min. 25 sec., and No. 717, again making a slow start, in 13 min. 5 sec.; the 5½ miles from Weldon to Harringworth were run in 5 min. 10 sec. and 4 min. 55 sec., with maxima of 71½ and 74 m.p.h. Manton, 18¼ miles, was passed in 23 min. 10 and 15 sec., and the lowest rates on the subsequent 1 in 143 strip of the 8-mile ascent from Harringworth Viaduct to Oakham were 40 and 45 m.p.h. The 11¼ miles of gently falling grades from Oakham to Melton took 12 min. and 11 min. 20 sec., with maxima of 66 and 71½ m.p.h., and

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total times to this point, 33¼ miles, were thus 40¼ min. and 39 min. 10 sec. Slacking carefully over Melton Junction, we mounted the 3½ miles of 1 in 200 up past Grimston on both runs at an average pace of 40 m.p.h., covering the 7½ miles from Melton to Upper Broughton in 9 min. 35 sec and 25 sec.; the 8 miles thence to Edwalton occupied 7 min. 20 and 5 sec., with sustained maxima of 75 and 77½ m.p.h., and thus No. 562 reached Nottingham in 60¾ min. from Kettering, and No. 717 in 59 min 5 sec. The latter was therefore 5½ min. to the good from London, while in view of the load the former engine also did excellently. Both engines kept 46½, while the maximum rate at Flitwick was 71½ m.p.h. There was little subsequent interest in the run, Wellingborough being passed in 74 min. 10 sec., Kettering in 82 min. 20 sec., Market Harborough in 96 min. 5 sec. (at 27 m.p.h.), and Leicester was reached in 117½ min., 2½ min. early. Out of Leicester we made a tremendously energetic start, passing Loughborough, 12½ miles, in 14 min. 10 sec., at no less than 71½ m.p.h. (on a practically level track), but after that we eased down very much again, and took 24 min. 25 sec. to Trent.

In the up direction a run on the 3.50 p.m. from Leicester to London behind a non-

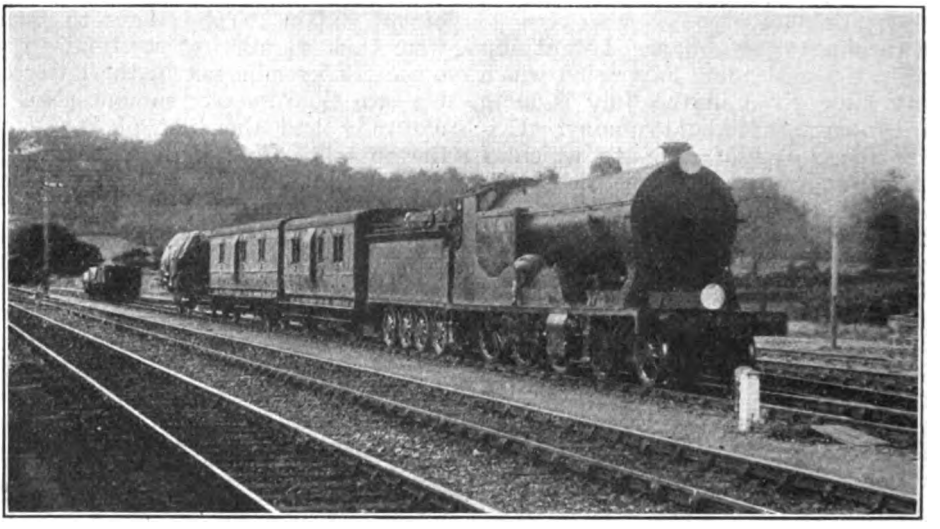

Photo.] LONDON & SOUTH WESTERN RAILWAY. [*J. D. Thomson.*

4-6-0 engine No. 334 (first Drummond 4-cylinder series), at Seaton Junction.

time onwards to Leeds with the greatest ease, but the difficulties of this section, which are reflected in the very easy timings, do not afford much of interest to the recorder.

Between London and Leicester several runs need description. On the 11.30 p.m. down Glasgow express 4-4-0 compound No. 1006 had a featherweight load of 165 tons, and passed Kentish Town in 3¾ min., Hendon in 11 min. 5 sec., Elstree in 18 min. 5 sec., St. Alban's in 25¾ min., Luton in 37 min., and Bedford in 55¾ min., after which the engine was very much eased. Prior to that we had topped Elstree at 43½ m.p.h. and Sandridge at superheated 4-4-0 of Class 3, No. 745, was unusually good. This train is the 1.15 p.m. from Manchester (Victoria), and I travelled in it throughout, but the running had little in it of locomotive interest north of Leicester. The tare load was exactly the maximum for this class of engine on the 118 min. timing—220 tons—and as the train was packed to standing, the gross load could not have been less than 240 tons. From Leicester we covered the 10½ miles up to Kibworth in 15¼ min., and passed Harborough at reduced speed (16 miles) in 21¼ min. We climbed the 5 miles up to Desborough in 8½ min., and then did some very fast

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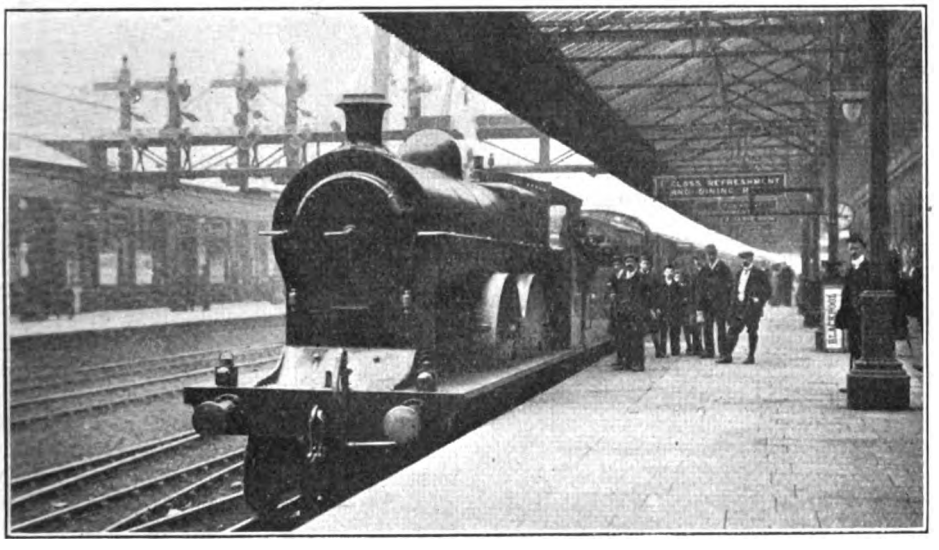
running, covering the 6 miles from Desborough to Kettering in 5¾ min., and the 7 miles on to Wellingborough in 5 min. 55 sec., with a top speed of 75 m.p.h. The 5¼ miles from the latter station up to Sharnbrook summit occupied 7 min. 10 sec. (minimum 27 m.p.h.), and the 10 miles thence to Bedford took just 10 min., speed rising to 74 m.p.h. Thus we had covered the 49¼ miles from Leicester in 58 min. 35 sec., and it was the first time for a number of years that I have recorded such a time as 23 min. 5 sec. from Kettering to Bedford. From Bedford up to Luton the 19½ miles occupied 24 min. 40 sec.; the 10¼ miles on to a.m. from Manchester to London, which was taken forward from Derby by the superheated compound No. 1008. We had a 10-coach train of 300 tons (286 tare), but were doing 61½ m.p.h. on passing Draycott, and covered the 8¾ miles to Sheet Stores Junction in 11 min. 55 sec. Easing from there to the Trent Bridge we had worked up to 62½ m.p.h. on passing Loughborough, 17 miles (20¾ min.), and Humberstone Road, 28¾ miles, was passed in 32 min. 40 sec. Signals on outside Leicester made us take 35 min. 5 sec. to the stop instead of the 33¾ min. time we should certainly have effected otherwise; booked time for this 28½



LANCASHIRE & YORKSHIRE RAILWAY.

Blackpool express in Bolton Station.

St. Albans were run in 10 min. 20 sec., and the 13 miles thence to Hendon in 12 min. 20 sec., speed not rising above 72½ m.p.h. at Radlett or 67 at Hendon owing to the engine being eased. Most unfortunately we were pulled up outside the terminus to wait the departure of an outgoing train, in addition to sustaining a signal check beyond Cricklewood; to the stop our time from Leicester was 114 min. 25 sec., but given a clear road we could have easily effected our arrival in 114 min. from the start. Here again was an excellent run, in consideration of load and engine.

Another very fair run was on the 9.10 miles is 37 min. It would have been most entertaining to see what this fine engine could have done with such a load on to St. Pancras, but a further addition made it up to 49 axles, 307 tons tare and 330 tons full (the train was now packed), and so we had to avail ourselves of the services of 4-2-2 No. 673 as pilot. Getting off in great style, we were through Kibworth in 13¾ min., and Harborough in 19½ min.; Desborough was breasted in 27 min. 20 sec., and Kettering in 33½ min. (at reduced speed), Wellingborough being reached, after a preliminary signal check, in 42 min. 10 sec., or 41 min. net. Allowance for this 33 miles is 42

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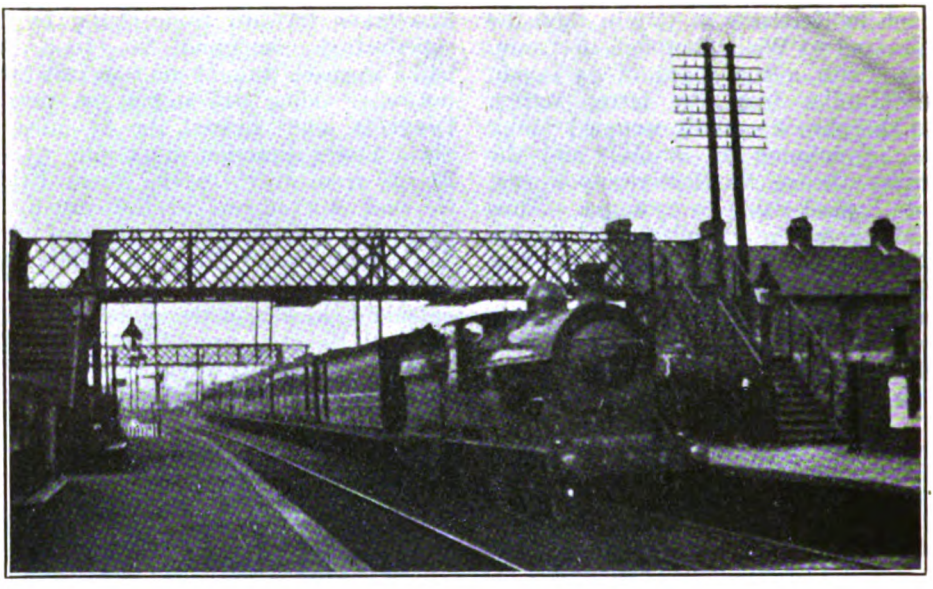

Photo.] GREAT NORTHERN RAILWAY (IRELAND). [*W. P. Sefton.*

Up "Limited Mail" passing Adelaide. 4-4-0 engine, No. 172.

min. Re-starting, the two engines climbed the 5¼ miles to Sharnbrook summit in 8 min. 55 sec.—an excellent piece of work—and then touched 75 m.p.h. on Sharnbrook bank, but only to be brought down to a walking pace for adverse signals outside Bedford. So the 15¼ miles to Bedford took 19¾ min. After that the two machines accelerated to and maintained a speed of 50 to 51 m.p.h. on the continuous 1 in 200 ascent to Ampthill—another good performance—touched 56½ at Flitwick, and fell to 46½ at Toddington, thus running the Bedford-Luton length, started at little more than 10 m.p.h., in 24 min. 10 sec. With time now well in hand, there was little further of note in the running, the remaining 30¼ miles into the terminus taking 34¼ min.—total 78 min. 10 sec. for the 65 miles from Wellingborough, or 75 min. net.

Moving now to the northern extremity of the line, I will describe two good runs from Hellifield to Carlisle, both behind re-built and superheated Class 2 four-coupled engines. On the night express from St. Pancras, whose running as far as Trent I have already described, I awoke in time to record the work north of Hellifield, where our engine was No. 433, with an unchanged load of 165 tons. The other trip was on the 5 p.m. train (11.45 a.m. from St. Pancras), and the engine was No. 540, with a load of 190 tons tare (the scheduled maximum exactly) and 200 tons full. From Hellifield we passed Settle Junction, 3¼ miles, in 4¾ and 5 min., at speeds of 64 and 60 m.p.h. and then ran the 14 steeply-ascending miles to Blea Moor in 24 and 24¼ min., speeds on passing the box being 31½ and 28½ m.p.h. respectively, although 540's time of 8 min. 50 sec. for the 4¾ miles from Horton to Ribblehead beat that of No. 433 by 5 sec. For the 11¼ miles from Blea Moor to Ais Gill, commencing with the last mile of the climb from Settle, but afterwards mostly a "tableland" at high altitude, No. 433 took 13 min. 40 sec. and No. 540 14¼ min., the highest rates at Hawes Junction (passed in 39 min. 5 sec. and 40 min. 5 sec from Hellifield) being 61 and 58½ m.p.h., and the lowest at the summit (42 min. 25 sec. and 43½ min., 28½ miles), 51 and 55 m.p.h. After this No. 433 was troubled by quite a thick early morning mist, in patches, and so ran moderately down hill, taking 16 min. 55 sec. for the 17½

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miles from Ais Gill to Appleby, 15 min. 5 sec. for the 15¼ miles thence to Lazonby and 16 min. 40 sec. for the 15¼ miles from Lazonby into Carlisle—total 91 min. 5 sec. (a minute overtime) from Hellifield. We did touch 72½ m.p.h. beyond Crosby Garrett, but the maxima ranged mostly from 67 to 69 m.p.h.; the minimum on the short ascents beyond Lazonby was 56½ m.p.h. But No. 540 put up some real old-time running, doing Ais Gill-Appleby in 16 min., maximum 75 m.p.h.; Appleby-Lazonby in 13 min. 35 sec., again with a top speed of 75; and Lazonby to Scotby, 12¾ miles, in 12½ min.—total, 45½ miles in 42 min. 5 sec.—falling to 54 m.p.h. beyond Lazonby, and running very easily at a maximum of 67 through Cotehill. So we reached Carlisle, with maximum schedule load, in 89½ min. from Hellifield, which we could have cut to 88 by faster work on the final stage.

On the 12.1 a.m. from Carlisle to the south, a smart run by No. 735, a superheated 4-4-0 of Class 3, deserves mention. Load was 29 axles, 178 tons tare and 185 tons full. A fine start was made, the 10 miles to Armathwaite, rising almost exclusively at 1 in 129–134, being covered in 14 min. 50 sec., while at Lazonby speed had risen to as much as 68 m.p.h. The latter station, 15¼ miles, was passed in 20 min. 35 sec., and the 15¼ miles up to Appleby was run in 18¾ min.—a fine uphill average of all but 50 m.p.h. So we passed Appleby in 29 min. 30 sec., and then, after touching 61 m.p.h. at Ormside, we eased somewhat, taking 29 min. 10 sec. for the 17½ miles from Appleby to Ais Gill, and reaching Hawes Junction, 51¼ miles, in ¼ min. under the 73 min. schedule. A curious experience on this occasion was that of travelling at this altitude in a first-class express actually in the clouds. The remainder of the journey merits no attention, as we were so well on time; despite the most cautious of descents to Settle, a bad p.w.r. check at Skipton, and a series of severe signal checks south of Keighley, culminating in a virtual stop at Shipley, we only lost 35 sec. on the 74 min. allowance for

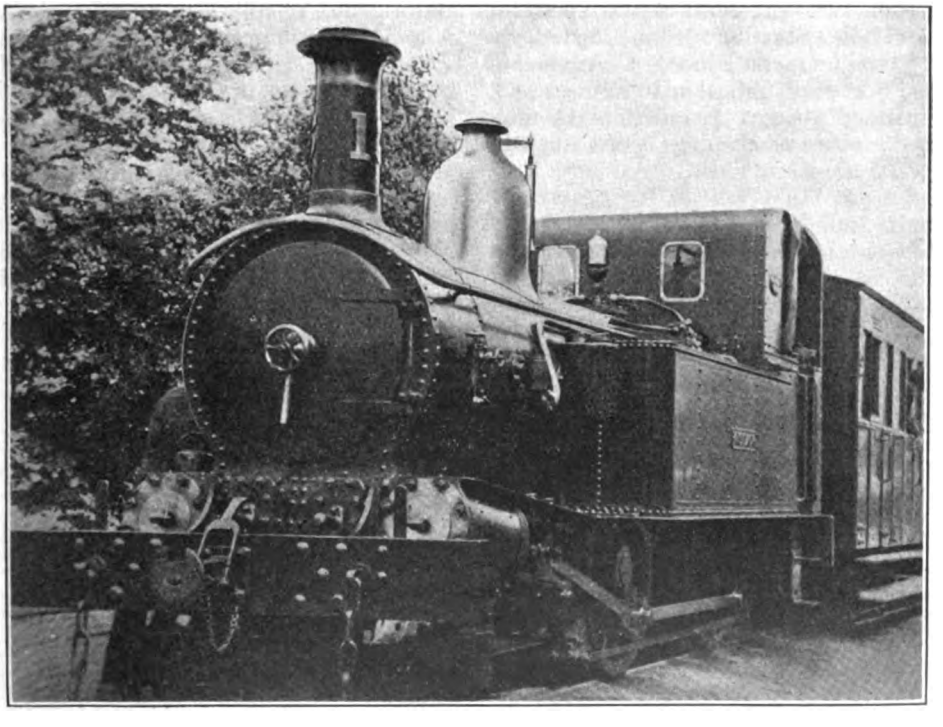

Photo.] **ISLE OF MAN RAILWAY.** [*J. W. Idle.*

Tank engine, "Kissack," at Port St. Mary.

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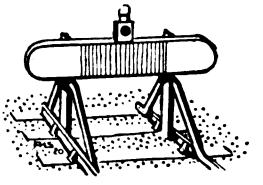
the 61½ miles from Hawes Junction to Leeds.

In conclusion, I would like to supplement the details given in the last issue of running on the Great Northern Railway of Ireland by the description of a really exceptional journey timed recently by a friend on the up "Limited Mail." The finest travelling was performed between Belfast and Dublin, where the locomotive which figured in my records—No. 174, *Carrantuohill*—was again at the head of the train. From Belfast the load was 137 tons tare and 145 tons full, and from Portadown 170 and 180 tons respectively. A brilliant initial run was made over the first 25 miles to Portadown in exactly 28 min—3 min. under schedule, and at an average speed of 53.6 m.p.h. start-to-stop—Lisburn, 7½ miles, being passed in 10 min. 35 sec., mile-post 96½, 16 miles, in 19 min. 10 sec. (the time to the actual summit at mile-post 96 must have been a shade over 19 min. 25 sec., as the average speed up the final ascent was 56½ m.p.h.), and Lurgan, 19⅞ miles, in 22 min. 57 sec. The 6¼ miles between Kilmore and Seagoe boxes were covered in 5 min. 38 sec., with a top speed of 70½ m.p.h. Starting from Portadown with the increased load, *Carrantuohill* passed Scarva, 7⅞ miles, in 10 min. 42 sec., and Goraghwood, 15⅝ miles, in 19 min. 32 sec., after slackening speed slightly over Poyntzpass curve. A very fine ascent was then made to Adavoyle summit (mile-post 65½), the 6⅜ miles from Goraghwood being accomplished in 9 min. 28 sec. with a sustained rate of 37 m.p.h. on the last 2½ miles of the climb. But the effort was not to cease there, for my friend's most careful timing reveals the fact that a maximum rate of no less than 82 m.p.h. was reached in the descent to Dundalk. This is supported by the times, as the 6 miles from mile-post 61 to Brick Works Box were run in 4 min. 38 sec.—a rate of speed which many readers doubtless have not associated hitherto with the Emerald Isle. So Dundalk, 33¼ miles from Portadown, was reached in 39 min. 32 sec., 3½ min. under schedule, and at an average of 50.4 m.p.h., despite the mountainous intervening ascent. *Carrantuohill* was thus responsible for a gain of all but 6½ min. on schedule in this short distance.

At Dundalk, No. 157, a 4-4-0 of the "Neptune" class formerly named *Orpheus*, and now rebuilt by Mr. Glover with superheating apparatus, came on to the train. Subsequent work, though good, was not exceptional; from Dundalk Dromin Junction, 10⅝ miles, was passed in 13 min. 27 sec., and the 6⅜ miles thence up to the summit at mile-post 37¼ were run in 7 min. 27 sec., the lowest speed being 45 m.p.h. Drogheda, 22½ miles, was reached in 27 min. 12 sec. (schedule 28) after the usual slack over the Boyne Viaduct. From Drogheda, No. 157 passed Balbriggan, 10 miles, in 12 min. 55 sec., mile-post 16 summit, 15¾ miles, in 19 min. 27 sec., and Howth Junction, 27 miles, in 30 min. 43 sec., the top speed at Malahide being 66 m.p.h.; after Clontarf there came a severe relaying check, but an arrival was effected at Amiens Street in 37 min. 5 sec., or about 36¾ min. net for the 31¾ miles from Drogheda. Thus No. 157's gains, totalling 2 min., when added to *Carrantuohill's* 6½ min., give an aggregate of no less than 8½ min. on these fast bookings, and the running reflects still further credit on Mr. Glover's fine machines.



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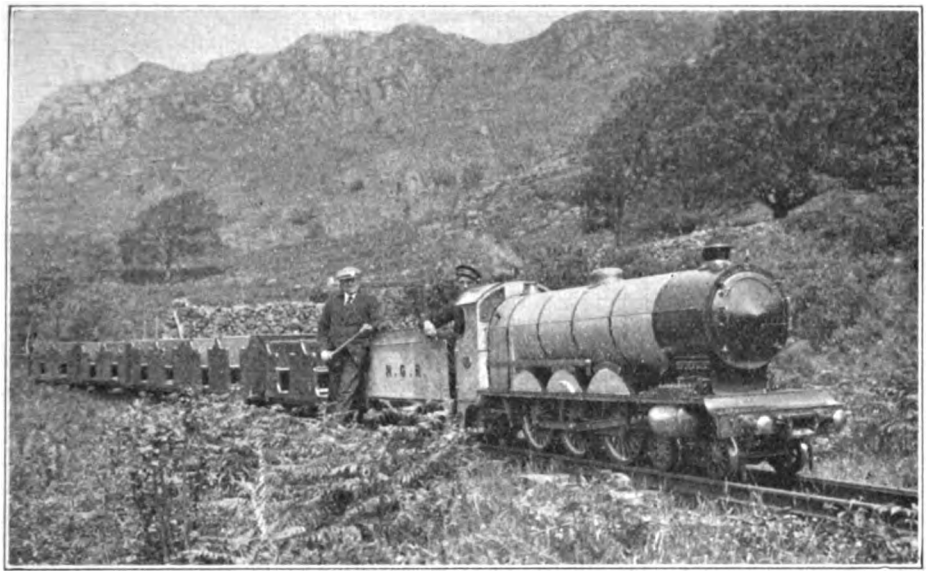

NARROW GAUGE RAILWAYS, LIMITED.
New 4-6-2 express locomotive, *Sir Aubrey Brocklebank*, on the Eskdale Railway.

A Scene on the Eskdale Railway.

TO Sir Aubrey Brocklebank, Bart., the RAILWAY MAGAZINE is indebted for some recent photographs taken on the Eskdale Railway in Cumberland, one of which is reproduced on this page. The print depicts the new 4-6-2 express engine recently put into service undergoing trials between Muncaster and Irton Road, the rugged Muncaster Fell, seen in the background, being typical of the picturesque scenery traversed by this line.

The new locomotive is generally similar in type to the previous 4-6-2 engine "Colossus," built at Northampton by Messrs. Bassett-Lowke, Ltd., save that the boiler is pitched higher, and a six-wheeled tender is provided in place of one on two four-wheeled bogies; it is named after, Sir Aubrey, whose Cumberland property is skirted for some distance by the railway.

An excellent summer service of trains is being run, consisting of five in each direction daily, with extra trains on Saturdays, and including a non-stop morning "express" from Ravenglass to Dalegarth. The latter is a new station, between Beckfoot and Boot, opened for the first time this summer, and provided with well-fitted refreshment room and other conveniences for passengers. The summer time-table for 1920 shows a novelty in the way of a slip coach on the 11.20 a.m. non-stop train from Ravenglass to Dalegarth. This coach is slipped at Irton Road at 11.38 a.m. This is the first instance of such an operation being put into practice in any regular service on a miniature railway.

For the benefit of those unacquainted with this little railway 7½ miles in length, it may be added that the gauge is one of 15 in. only, and that the passenger working is carried on mainly by model express engines, built to a scale of one-quarter full size, and with a degree of realism in reproduction that is evident in the photograph.

RAILWAY MAGAZINE readers visiting this part of Cumberland should in no circumstance miss the opportunity of making the acquaintance of "the smallest public railway in the world."

An illustrated article describing the Eskdale Railway, including a map and a gradient profile appeared in the RAILWAY MAGAZINE, December, 1915.

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Traffic Aspects of Track Lay-Out.

By J. F. GAIRNS, M.I.Loco.E.

"KEEP MOVING" is an accepted axiom of good traffic operation, but practice is complicated by the fact that at times and in particular places conflicting movements are inevitable, while trains may also require to "cease moving" for reasons equally as important as those which support the policy indicated. The problem is, then, how to reconcile these factors, and the best solution is to adopt the principle that (*a*) trains ceasing to maintain standard running should be diverted from through roads; and (*b*) that normally conflicting traffic should be given non-conflicting routes whenever practicable.

In their simplest forms (*a*) is met by the provision of platform loops at stations, so that either stopping passenger or goods or mineral trains may be diverted from the through line to allow a superior train to pass, and (*b*) by the adoption of "flying" or "burrowing" junctions in all busy situations. Both these methods also possess certain other attributes which are worthy of attention. Fig. 1 represents the main features, apart from the bays, of Addison Road station. Here there are long platform loops and centre roads, but the latter are used mainly by goods trains, frequently to allow passenger trains to overtake and precede them, besides which the cross-overs midway permit a passenger train, after stopping at the rear portion of the platform, to turn on to the centre road and thus pass another train standing at the forward section of the platform, or one train can pass another which is standing at the rear portion of the platform and itself reach the platform in front of it. Similar arrangements, partially or completely utilised, also exist at certain of the large stations, and the writer would recall a time-table operative in pre-war days according to which there were two 2.35 p.m. Liverpool and Manchester expresses, both scheduled to leave the main south-bound platform at York. In practice the through North Eastern Railway—Lancashire and Yorkshire Railway express left the southern section of the platform while a through North Eastern Railway—London and North Western Railway train similarly left the northern section by turning on to the middle road, the two trains being then able to travel side by side as far as Church Fenton, where their routes diverged, in view of the four roads available for that distance.

At ordinary loop platform stations it is also practicable for a stopping passenger train to pass a goods, the former taking the platform loop while the latter remains on the through line. Where the platforms are placed between the through and loop lines as islands the arrangement is convenient for interchange between a local and a through train calling for transfer purposes. This arrangement is frequently more suitable than the usual provision of outside slow line platforms, with a central island between the fast lines on four-track sections where the fast roads are placed in the centre, especially since the extensive use of corridor and sliding-door coaches has reduced the dangers attaching to swing doors at wrong-sided platforms.

Under some circumstances there is good ground for advocating the placing of platform loops in the centre, surrounding a single island, the through lines passing outside, though this is usually only suitable for stations having relatively light traffic. This principle, elaborated in various ways, was strikingly developed in the course of Mr. Donovan H. Lee's article "Why Not Another Four-Track System?" published in the RAILWAY MAGAZINE, April, 1919.

There are a few places where the same root principle is already adopted. Thus at Leicester, Great Central Railway, there are passing lines outside the big island platform, and we have known the old 3.15 p.m. "Sheffield Special" to detach the Leicester slip-coach on this road, while at Victoria Station, Nottingham, through roads outside the two main islands are available. Waverley Station, Edinburgh, also permits of this being done, though usually the outside tracks are utilised for breaking-up or making-up

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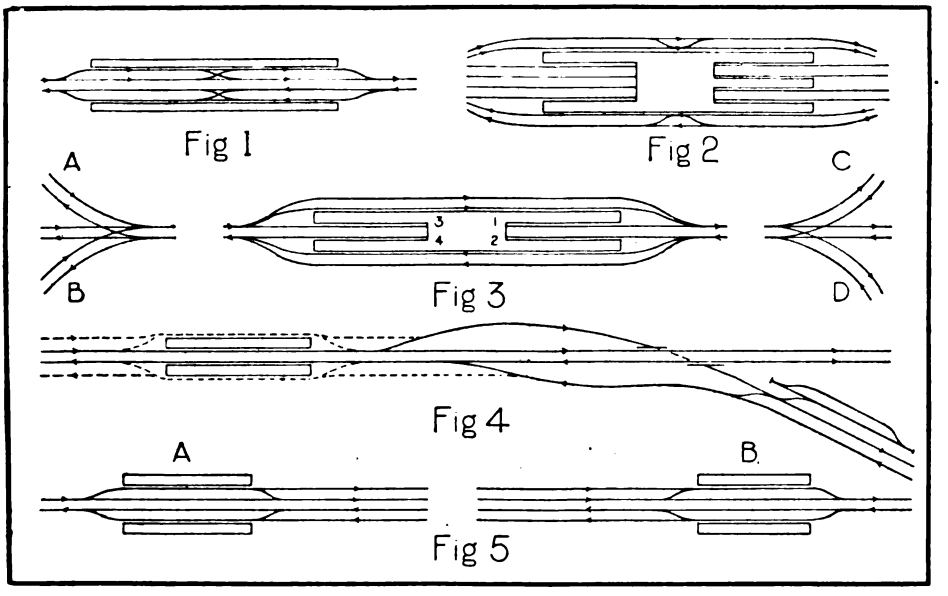
through Anglo-Scottish trains, or to permit trains to reach or leave forward or rear sections of the main platforms notwithstanding that the other portions may already be occupied.

Rugby, London and North Western Railway, is also based on this idea as shown in Fig. 2 (main features only), the station being concentrated in one island, with terminal bays for local and connecting trains, giving complete interchange facilities, while non-stopping trains can pass other expresses doing station work by means of the through lines outside the screens. The half-way cross-overs also enable trains to reach or leave either section of the main platform as required.

In some cases the central island principle is developed in a striking manner, and Fig. 3 shows the main features which are found at Ferryhill, North Eastern Railway. No. 1 branch train from A runs past the station on the outside line and backs into bay line No. 1. No. 2 branch train from B similarly runs past and backs into bay No. 2. At the same time branch trains Nos. 3 and 4, respectively from C and D, run past and back into bays Nos. 3 and 4. Each pair of branch trains would arrive about five minutes apart, but there is no conflict whatever between the two pairs. Main line trains then arrive on each through platform, and after doing station work and interchanging with the branch sets, depart north and south. No. 1 branch train then leaves for C, followed by No. 2 for D, while at the other end Nos. 3 and 4 similarly leave for A and B respectively. While the main line trains occupy the through platforms it is quite possible for expresses to pass on the outside roads, though at Ferryhill there are entirely independent through lines a short distance away. Several other ways of manœuvring to suit traffic requirements are also available with this lay-out, which need not be further elaborated. Naturally all of the possibilities thus afforded will not be utilised on every occasion, but in view of the wide interconnection facilities afforded and the avoidance of conflicting movements, the arrangement outlined is an admirable one.



FIGS. 1–5.

Fig. 4 shows the usual "flying" or "burrowing" junction system, elaborated to show its adaptability for four-track connections and usefulness for local terminal purposes. In the simple form shown in full lines the down branch road diverges to the left and crosses under (or over) the main lines, so that there is no conflict with opposite direction traffic. In the case of a train terminating locally it is sent along the branch to a reversing

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siding, as indicated, and on returning it can reach the up side without conflicting with down traffic. Elaborated as shown in dotted lines, a platform loop is provided on each side, available either for main-line stopping trains or for the branch service, while terminating trains need not affect the main lines. A good example of this system is available at Wood Green, Great Northern Railway, except that there is also a through down line without platform and goods roads.

The only other running condition which need be dealt with at length, apart from four-track provision, is the extended running loop for goods trains, as indicated in Fig. 5. By the term "running loop" is generally understood one of considerable length, and intended for continued movement as distinct from one designed only for passing and lie-by purposes. According to the diagram the loop lines are supposed to extend from one station to the next, say, for two or three miles, as occurs on country sections where such loops are usually provided. Consequently it is possible for either a stopping passenger or a goods train to travel from A to B or from B to A, and yet permit a faster train on the through line to overtake and pass it by virtue of the slower speed or the station stops of the former train, delay as between the two trains being avoided or minimised. Even if delays cannot always be obviated there is distinct advantage in that long goods trains can be kept moving, although at slow speed; back-shunting into sidings is not necessary; or, if occasion arises two or more goods trains can be diverted permissively to the loop to clear for superior traffic. Such sections, whether used to secure continuous running or to release goods trains from the main lines, possess great value in that they allow a length of otherwise two-track line to be relieved intermediately, possibly avoiding the necessity for four-tracking a much longer distance.

Two other running conditions may be mentioned incidentally. The first is the practice adopted on the Highland Railway in the case of high speed single-line passing places. Ordinarily approaching trains have a straight run through the facing points at each end of the loop, necessary curvature being given in the trailing direction. But on long grades where one direction only permits of fast travelling—tablets are often exchanged at speeds up to 60 m.p.h.—the favourable direction is given a straight road at both ends of the loop as shown in Fig. 6, the slow speed direction having curvature at both facing and trailing points.

The other condition mentioned (Fig. 7) is that of a country junction with one platform only on one side and an island on the other. A through train to the branch has only ordinary junction conditions, but in the other direction it usually takes the outside of the island. The branch train is, therefore, able to reach the platform at the same time as the main line is cleared for a train to run through, or to stop for interchange purposes. The dotted lines apply to terminal and reversing arrangements for local branch trains.

It is now necessary to consider terminal arrangements, and intermediate facilities for this purpose may first be dealt with. In earlier days the usual course was to provide a bay platform on one side. Where traffic is not specially heavy this still suffices, but if the principle is adhered to that facing points on through high-speed lines are not to be used, and a lay-out, as in Fig. 8, adopted, there are several possibilities of delay. As represented, a terminating train has to run first into the main platform and then back to the siding to reach the bay platform. In practice passengers are usually detrained and luggage unloaded before shunting, so that the main line is not cleared for some time. Departure is more convenient as the through line on the other side is not affected until the local train is scheduled to leave, but both tracks are then blocked to other traffic. There is, however, the disadvantage that transfers of passengers and luggage from one platform to the other are involved. If the bay is on the other side similar difficulties are involved, differing according to the altered conditions, but in the aggregate of about the same character.

In Fig. 9 bays are provided on both sides and the arriving train is able to run direct to its bay. It is then at once clear of the through line, and as transfer across to the other side can be made as convenient between main line train movements, sources of delay are minimised, and transfer of traffic between main line and local or branch trains is facilitated in both directions.

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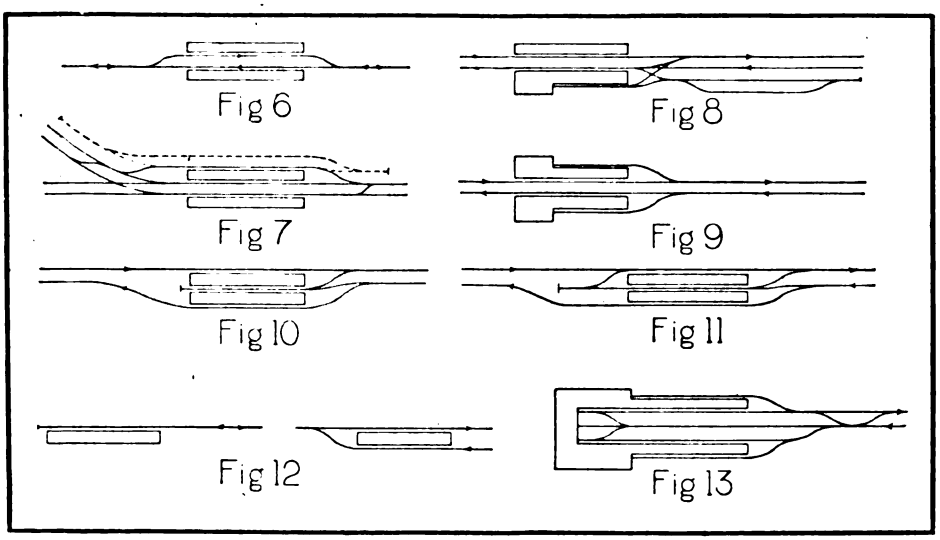
Where traffic is heavy such arrangements will rarely meet the needs of the situation. It is then best to provide a central terminal road as in Fig. 10. This is the simplest form, suitable only for non-locomotive electric trains or rail motor cars. To provide run-round facilities a trailing crossover from an engine stub to a through line (Fig. 11) enables the necessary shunting movements to be made, and in some cases, as at Nunhead, South Eastern and Chatham Railway, run-round sidings are provided between the through lines and beyond the platform for reversing centre road trains clear of other traffic.

In the case of final terminal arrangements matters become much more complicated and may easily constitute the "rock" upon which the "waves" of "intense" traffic break to their confusion. There must be very few locations where the acme of simplicity realised by Fig. 12 can exist, and we know of only one instance where it is to be found. Obviously this can only apply with electric trains or rail motor cars, for there is not even run-round provision. Yet a 10-minute service in each direction is thus dealt with at Hounslow Barracks, Metropolitan District Railway. In this case double line ceases at the previous station—Heston-Hounslow—the final run being a single track with no other facilities whatever.

At ordinary terminals the best arrangement includes arrival and departure lines with a centre road for running round purposes, or to enable arriving engines to be released before the coaches are removed. And if bay lines are provided on either side as in Fig. 13, and all platform lines are signalled for both arrival and departure, then four trains can be dealt with at once, however diversified.

Dealing now with traffic on a busier scale, this generally involves provision of more than two running tracks. The first development is to duplicate the arriving line, for there are necessarily greater possibilities of variation from schedule in that direction. Thus one down road is frequently sufficient, although two up roads may be essential to deal with the volume of traffic involved and to allow overtaking and passing of trains coming from several places and scheduled on differing bases.

As a rule, however, duplication of both roads is necessary. If the two fast lines are placed in the centre the arrangement is eminently suited for flying or burrowing junction connections further out, but the situation is somewhat complicated at the terminus itself. The great difficulty is that the up slow line outside is entirely on the wrong side for access to platforms convenient to the down slow line, and *vice versa*, and the conflicting train movements thus involved tend to become almost prohibitive at a busy station. In fact, assuming eight platforms to be



FIGS. 6–13.

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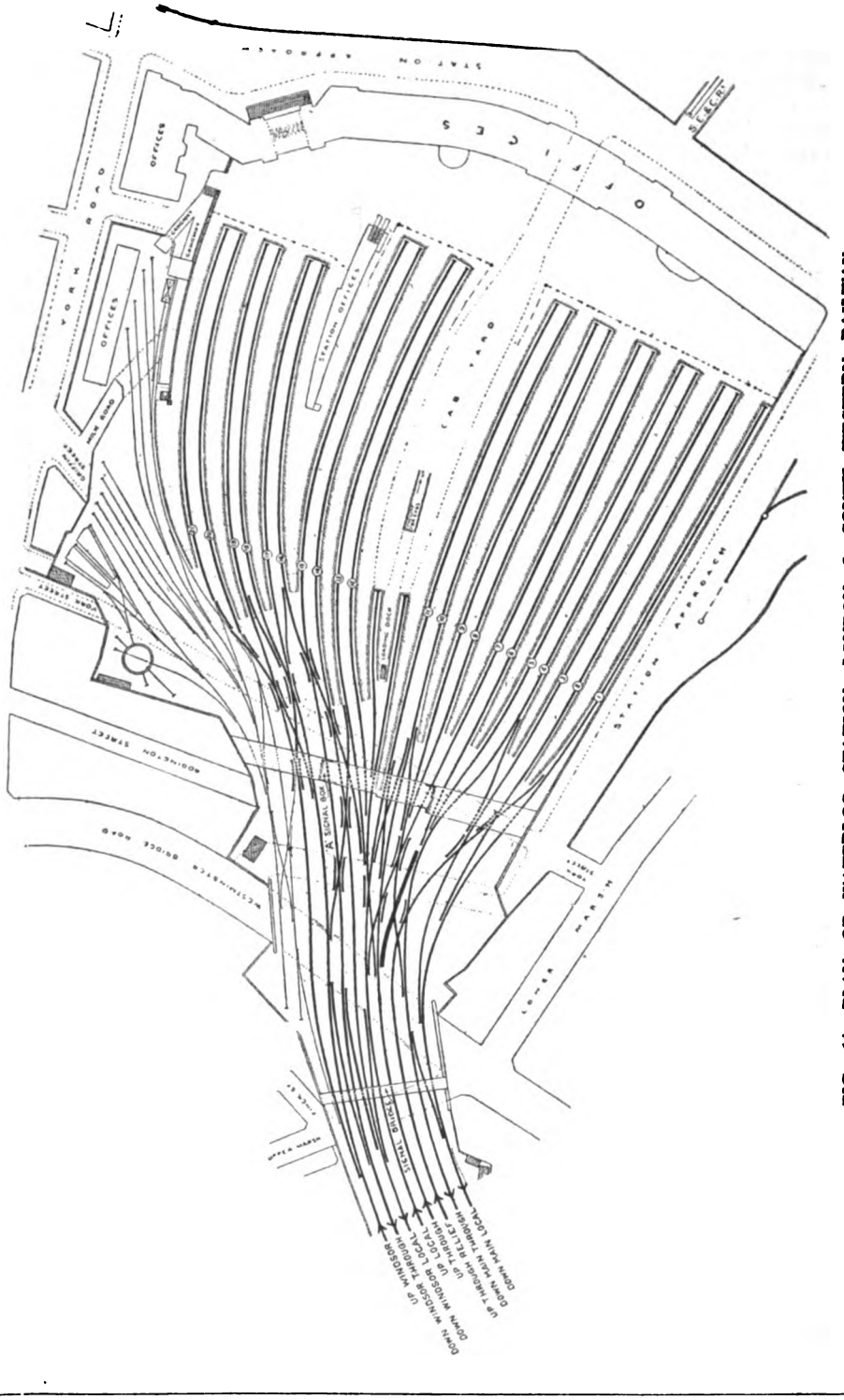

FIG. 14.—PLAN OF WATERLOO STATION, LONDON & SOUTH WESTERN RAILWAY.
Showing arrangement of up and down lines to suit traffic access to the various platforms. The new cross-over from the "up through" road is indicated as a thick line.

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numbered consecutively from the down side, an arriving train from the up slow line must foul the connections of the up fast, down fast and down slow, whether arriving or departing, unless it is going to a platform of a higher number than that which applies to other trains concerned. Thus, if it is going to No. 1 every road in the station is blocked; to No. 2, all except No. 1; to No. 3, only Nos. 1 and 2 are free, and so on. Similarly a train leaving for the down slow line conflicts with movements either to or from all platforms of lower number. As a result, at most stations where this system of lay-out is adopted it is necessary to re-arrange the approaches. At Waterloo, London and South Western Railway, the up lines on the main section are in effect transposed between Vauxhall and the terminus; in fact they become three: up main, up main relief and up local, so that trains reach the terminus on the line most suitable for the platform for which they are destined. The lay-out here is, in fact, of so great interest that a complete track plan of the Waterloo approaches is reproduced in Fig. 14. This shows also the additional cross-over which is being laid in as described in the April RAILWAY MAGAZINE.

Conditions are not quite the same on the South Eastern and Chatham Railway approaching London Bridge, as there is a wider range of interchange for running traffic to be provided for. Indeed, the whole situation as regards track lay-out is so remarkable that the sketch plan reproduced as Fig. 15 is well worthy of study.

Between Charing Cross and Cannon Street the four-track is peculiar in that the two up roads enclose the two down lines. On analysis it will be seen that this is due to the fact that the northern up and down pair—designed mainly for Cannon Street-Charing Cross traffic—are reversed to give right-hand running, the southern pair, placed as usual, applying more to trains direct between Charing Cross and London Bridge.

This lay-out is really unnecessary now, seeing that no regular trains are scheduled to serve both termini. According to old methods an up train arriving at Cannon Street, and booked to continue to Charing Cross, was generally sent right across to the further side of the station while crossing Cannon Street bridge, and was then convenient for a direct journey to Charing Cross *via* the northern up road, without further conflict with other traffic. Similarly, down trains from Charing Cross scheduled to serve Cannon Street, travelled *via* the northern down line and on Cannon Street bridge crossed to the desired platform. As this method is not now general there is less special value in this peculiar lay-out, but the interchange track facilities available intermediately enable either pair of tracks to be used by all trains according to whether they use the older or the newer bridge at Charing Cross.

Special interest attaches, however, to the London Bridge–New Cross section. At London Bridge all down roads are on one side and all up roads on the other, but these quickly become intermixed and all the way to New Cross the process of "sorting out" is continued, rendering this one of the most complicated sections of line in existence.

In the main station at London Bridge there are three down lines and four up lines, one without platform. Alongside is the low-level terminus. Within a short distance these become three down lines, two up lines and three lines (one down and two up) allocated to the Brighton system, though South Eastern and Chatham Railway trains for Croydon, Caterham, Redhill and beyond transfer to these at an early stage. There are also the three London, Brighton and South Coast Railway South London lines (down, centre "reversible," and up). At Spa Road there is a further interchange to produce two down, two up, and down and up main lines, besides the three Brighton traffic roads for New Cross (London, Brighton and South Coast Railway); while the South London lines diverge to South Bermondsey Station. Near Southwark Park the Brighton lines diverge to New Cross (London, Brighton and South Coast Railway), and still another interchange takes place on the South Eastern and Chatham Railway section into three sets of down and up pairs, and these settle down to two similar sets through New Cross, the Greenwich lines having in their turn diverged.

This lay-out has been gradually built up by the successive improvements in the last 20 years or so, and to meet the

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peculiar needs of the situation could probably not be bettered without entire reconstruction. It has, at anyrate, solved the problems involved by the conditions which once gave the South Eastern a somewhat unenviable reputation for unpunctuality, though it is doubtful whether that reputation was ever correctly merited.

It will thus be seen that the "central fast" four-track arrangement requires relocation to facilitate terminal access under heavy traffic conditions. In fact, only two railways which use it maintain the principle on a terminal basis: the London and South Western Railway by modifying it as above described on the Vauxhall–Waterloo section (the South Eastern and Chatham Railway lay-out is not based upon this system though its peculiar features include some of its conditions), and the Great Northern Railway at King's Cross by sending a large number of its local trains *via* York Road and King's Cross suburban stations to and from the Metropolitan Railway. At King's Cross the suburban trains which use the terminus maintain main line conditions in that they arrive at one side of the station and are then transferred by means of a shunting spur across to the departure side; the station being entirely unsuited for any other method of working.

As a result many of the railways with large and busy termini find the allocation of lines in up and down pairs most convenient in conjunction with the sectionalisation of the terminus. Thus, from Liverpool Street there are three pairs of up and down roads: "Suburban," "Local" and "Through," and as a general principle platforms are allocated to one or other of these. Thus, normally, Nos. 1 and 4 are reserved for "Suburban" line traffic, and the conflict of arriving and departing trains is confined to these four platforms; Nos. 5 and 6 to the "Local" lines only, and Nos. 7–14 connect also with the "Through" lines; while Nos. 15 to 18 serve only the "Through" lines. Some platforms have only one access, others have two, but in no case can all three down or up lines be used for any one platform. The station is thus sectionalised into three parts, and conflicting movements are thus restricted to the section concerned. Any further transfers which may be required are made further down the line at Bethnal Green, Stratford or Hackney Downs, but in large measure the platforms of the terminus are allocated according to the set of roads served.

Finally, a brief description of the London Brighton and South Coast Railway main lines out of London may be reviewed, seeing that these include virtually all the runn ng conditions above mentioned in conjunction with several others not considered in detail. From Victoria to Selhurst the main route has slow and fast lines in separate pairs. The divergence of the Crystal Palace line at Balham is by a surface junction, but only for traffic purposes in regard to the slow lines. The Sutton line leaves in a similar way, but there are separate junctions for fast and slow lines, and the latter diverge on the down side to cross the four main-line tracks by a large girder overbridge on the "flying" junction system though not on that principle. Connection with the line from Tulse Hill and Streatham is also made by surface junctions at Streatham Common. Beyond Selhurst the branches towards Norwood Junction and West Croydon respectively, are also of a surface character, the one from the slow lines and the other from the fast lines. Conditions then become very much more complicated, but before dealing with them it is necessary to consider first the approaches to the same area from London Bridge. Leaving that station there are really two distinct sections, both of three tracks, in the one case of down, up fast and up slow, and in the other of down, reversible (of which more anon) and up. The former is strictly successor to the original South Eastern line over which running powers were exercised in the days of the old London and Croydon Railway, and as mentioned is also used by South Eastern and Chatham Railway trains in the Redhill direction as soon as the immediate approaches to the Brighton Station are cleared. It is understood that, strictly, only the down and the up fast lines are South Eastern, the up slow being Brighton property; at any rate South Eastern and Chatham Railway trains rarely, if ever, use the last-mentioned road.

The other set of three tracks is described as the South London lines, and at South Bermondsey Station these diverge towards Peckham Rye; but immediately beyond the station a loop is put off across to New

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Cross so that this route can also be used for traffic *via* New Cross, as it is, on occasion, to facilitate train working, or according to the platform used at London Bridge.

The South London lines only are electrically equipped at present and they have the further peculiarity that the centre road is signalled on a "reversible" basis. Thus it can be a second down road or a second up road, and is used as one or the other for stated periods in the day, according to which direction of traffic requires most relief. The spur towards New Cross is also three-track with the centre road "reversible."

The Peckham Rye route need not be further considered for present purposes. Returning, therefore, to the direct lines from London Bridge, as the spur from South Bermondsey makes connection the down line, this becomes double, so that onwards to Norwood Junction the route is four-track with fast lines in the centre. At Sydenham ordinary "flying" junctions affecting the outside slow lines serve the Crystal Palace branch, and north of Norwood Junction another "flying" junction gives connection from Crystal Palace, with a surface junction on the down side only from the South Eastern and Chatham Railway at Beckenham.

It will thus be seen that the Croydon area is approached from London Bridge by four tracks with fast lines in the centre, and from Victoria by four tracks in two pairs, fast lines on the up side. In the triangle between Norwood Junction, Selhurst and East Croydon, however, these have to be co-ordinated, with the further complication that at East Croydon the fast lines are on the down side, while, incidentally, connections have to be given for both Victoria and London Bridge trains towards West Croydon, connections direct from Norwood Junction to Selhurst are required, and extensive goods and carshed lines are further involved There are, in fact, miles of sidings in this area; but Fig. 16 shows the main features of the running connections given by means of what is probably the most remarkable series of "flying" junction lines in existence. For convenience Fig. 16 is drawn so that north and south are substantially shown right and left.

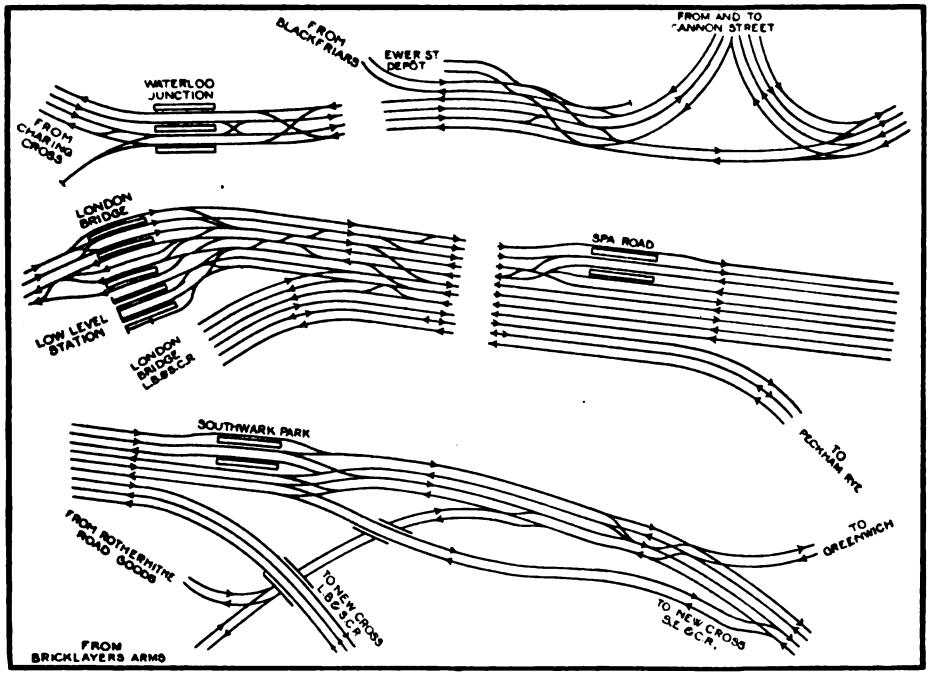

FIG. 15. SKETCH PLAN SHOWING S.E. & C.R. TRACK ARRANGEMENTS, CHARING CROSS TO NEW CROSS.

Leaving Norwood Junction Station,

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down trains can interchange to one of the four down lines shown to the right of the diagram. Express trains to and from London Bridge have a clear road between Norwood Junction and East Croydon on the main lines, while expresses to and from Victoria also have a direct run across from Selhurst to East Croydon. The third and fourth down lines from Norwood Junction also give a straightforward run to East Croydon (the latter is mainly a goods road).

towards West Croydon, the latter also giving a route to the local lines at East Croydon. There is also a route to West Croydon direct from Selhurst on the fast line side. It will thus be seen that all the required interchange facilities are given, and mainly without surface junctions except where traffic is already reduced by sub-division.

But even when East Croydon is reached the London, Brighton and South Coast Railway has not quite done with inter-

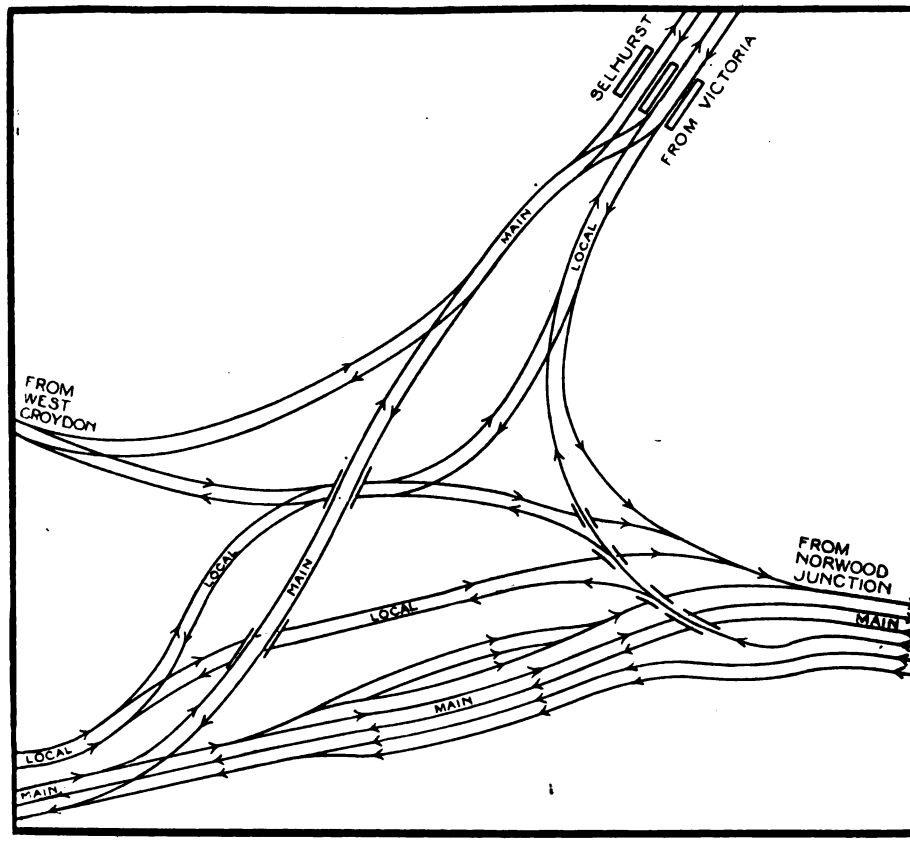

FIG. 16. SKETCH PLAN SHOWING NORWOOD JUNCTION-SELHURST-CROYDON CONNECTIONS, L.B. & S.C.R.

Otherwise the crux of the situation is the "Fork" line from the second down line at Norwood Junction. This rises up on a viaduct and crosses the main lines, then giving off two junctions, the first for the local line towards East Croydon and the second towards West Croydon. Corresponding up connections on the level give access from East Croydon and West Croydon towards Norwood Junction.

At Selhurst local trains have surface junctions towards Norwood Junction and change of tracks, for at Coulsdon the "Quarry" line leaves the South Eastern and Chatham Railway on the up side, combining with the Brighton slow lines, only to cross the old Redhill line before reaching Merstham tunnel, and at Earlswood there are again four tracks in distinct pairs, but with the slow lines on the up side.

It will thus be seen that almost every possible multiple track and "flying" junction condition is included within the

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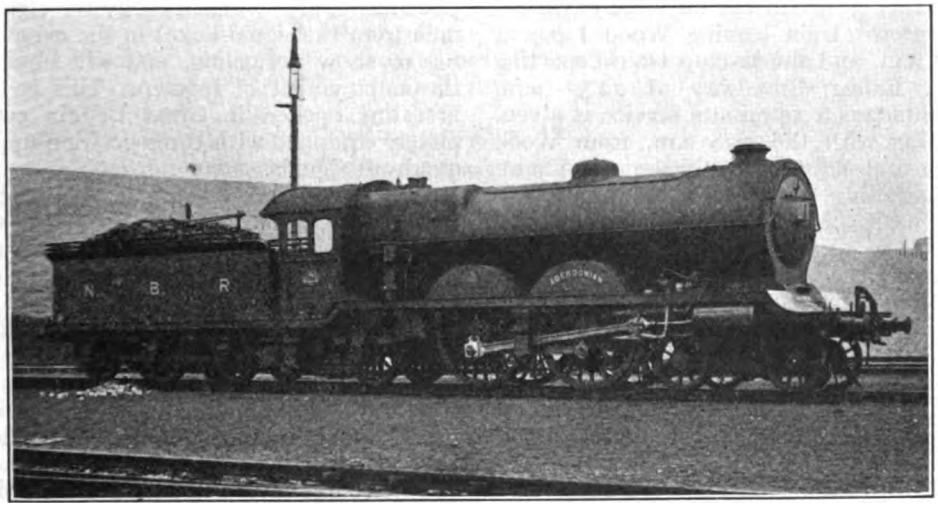
first 20 miles or so from London, a fact which renders this section of line probably unique in regard to the world's railways.

Enough has been said to indicate not only the importance of lay-out from the traffic point of view, but also how much ingenuity has already been expended in meeting the demands of heavy, complex and normally conflicting traffic by attention to track lay-out and running connections. Yet there are some possibilities which have still to be realised, and it remains to be seen whether the future will witness still more remarkable developments.

4-4-2 EXPRESS LOCOMOTIVE No. 868, "ABERDONIAN," NORTH BRITISH RAILWAY.

As Reconstructed and Fitted with Superheater Boiler.



LEADING DIMENSIONS.

Cylinders	21 in. by 28 in.	Heating surface, tubes (small)	1,136 sq. ft.
Coupled wheels	6 ft. 9 in. diam.	Heating surface, firebox ..	1,848 ,,
Bogie wheels	3 ft. 6 in. ,,	Superheater surface ..	385 ,,
Trailing wheels	4 ft. 3 in. ,,	Total ..	2,188·8 ,,
Steam pressure	180 lb. per sq. in.		
Heating surface, tubes (large)	483 sq. ft.	Grate area	28·5 ,,

Weight of engine in working order, 76 tons 14 cwt.; engine and tender, 122 tons 2 cwt.
Tender capacity: water, 4,240 gallons; coal, 7 tons.

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Opening of the Ealing and Shepherd's Bush Railway.

FULLY described in the July RAILWAY MAGAZINE there is no need to deal with this, the latest addition to London's system of electric railways, in detail, and for particulars and views of the line we may refer readers to that article. Two further photographs are, however, now reproduced, showing, respectively, one of the new platforms provided on the connecting lines from the Central London Railway at Wood Lane, and the other an electric train on the Wormwood Scrubbs "fly-over." Public traffic commenced on August 3 with a 10-minute service between Liverpool Street and Ealing Broadway on week-days, the first down train leaving Wood Lane at 5.45 a.m. and the last up train departing from Ealing Broadway at 12.52 a.m. On Sundays a 15-minute service is given, starting with the 7.28 a.m. from Wood Lane and finishing with the 12.13 a.m. from Ealing Broadway. A number of new trains have been ordered for the service.

Normally trains consist of six cars (two motors and four trailers), but during the slack hours of the day they are divided at Wood Lane and run as three-car trains only.

A special feature of the line is the signalling. Three-position upper-quadrant signals have been installed, those controlled from the signal-boxes being square ended, and the purely automatic signals having pointed ends. Distant signals have been dispensed with, the "on" distant indication being given by the midway position in the upper quadrant of the signal in the rear, or the exhibition of an orange light at that signal at night. The line is completely track circuited, the sections averaging 850 yards in length, while the average length of the overlaps is 400 yards. A train stop of the latest type is provided at each signal, and is raised whenever the arm is at the horizontal or "danger" position. An illuminated diagram showing the condition of the tracks on each side and position of the signals controlled by the signalman is provided in each signal-box. At certain of the semi-automatic or controlled signals which are a considerable distance from the signal-boxes, telephones have been provided to enable the motormen of trains stopped at the signals to communicate readily with the signalman. The signals are fitted with "long-burning" oil lamps.

About 200 yards to the rear of each signal a "fog light repeater" has been provided showing an orange light if the signal is at "danger," or a green light if the signal is at "caution" or "clear." These repeaters, which are illuminated electrically, are switched on by the signalmen from the signal-boxes in the event of fog or snow prevailing, and will obviate the employment of fogmen. This is the first line opened in Great Britain completely equipped with three-position upper quadrant signals.

Direct telephonic communication is provided between all stations, signal-boxes and offices on the line, and the sub-station and underground traffic controller's office at Leicester Square.

The staff for the new line is supplied by the Great Western Company, and the line is directly supervised by Mr. H. L. Wilkinson, the London Divisional Superintendent, and Mr. W. L. Monckton, London Divisional Engineer.

On Wednesday, July 28, a special inspection train was run over the new line, and subsequently a luncheon was held at the Holborn Restaurant. Viscount Churchill, Chairman of the Great Western Railway Company, presided over a large company, which included Lord George Hamilton, Major-General Sir Philip Nash, Sir Ernest Palmer, Sir William Bull, M.P., Mr. Charles Aldington, C.B.E., and directors and officers of the Great Western and Central London Railway companies.

The chairman, proposing "Success to the new service," said that the idea of the new line was first conceived by the Great Western Railway and they obtained powers in 1905 for a railway from Shepherd's

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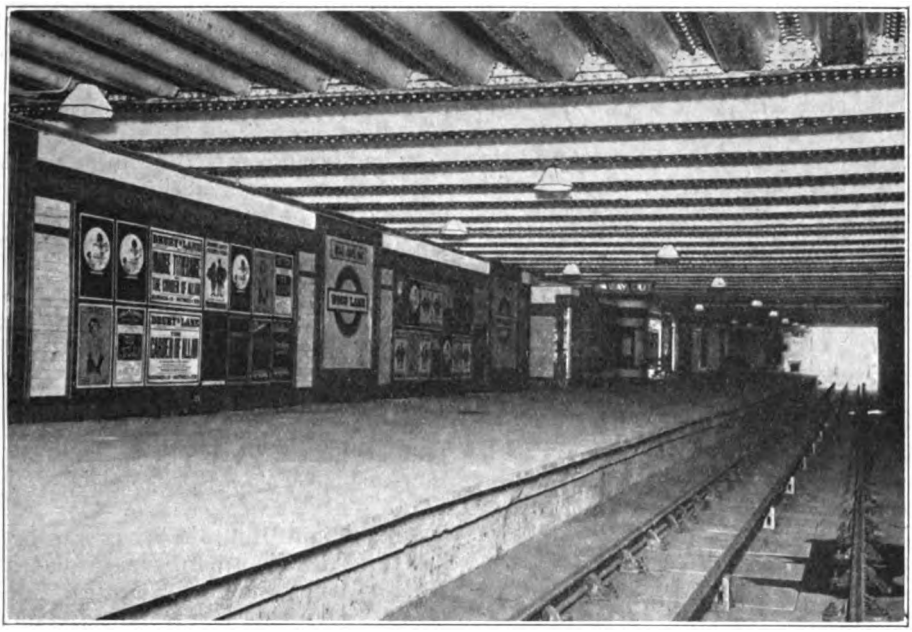
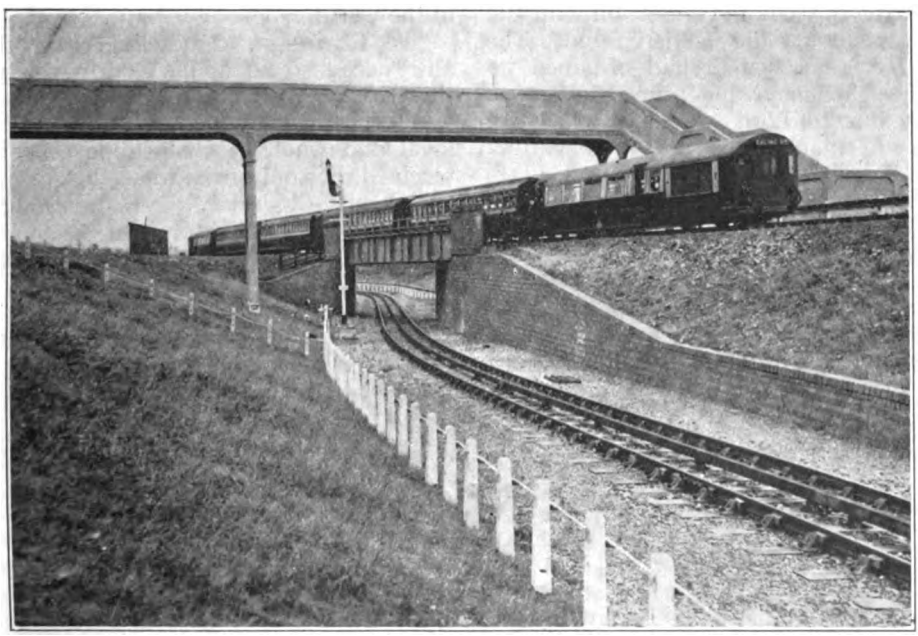


ONE OF THE NEW PLATFORMS AT WOOD LANE STATION.



DOWN LINE PASSING OVER THE UP LINE BY MEANS OF THE "FLY-OVER."

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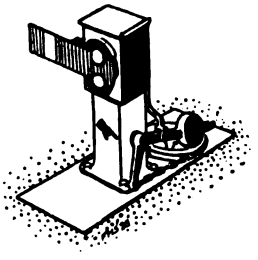
Bush to Ealing. As things developed they came into close touch with their friends on the Central London Railway, who, in 1911, obtained Parliamentary powers to extend their electrical service down to Ealing. The work on the line was hung up during the period of the war, and he thought they would agree that it did their engineers and everybody connected with the project great credit that they had been able so soon after the termination of the war to get this section of the line into working order. They had been for a little over a year running freight trains over that section of the line. Already great building schemes had been initiated, and he was sure permanent residents of Ealing and districts on the Great Western main line would find it a great advantage having a through connection by means of the Central London line with all the business and shopping centres served by that line.

Lord George Hamilton proposed the toast of "The Visitors and the Press," with which he associated the name of Major-General Sir Philip Nash. He said they all regretted the absence of Lord Ashfield with whom he had been associated for nearly 15 years in connection with the management of the Underground. The fact that that system had obtained its present efficiency and dimensions was largely due to Lord Ashfield's wonderful powers of management and observation. Sir Philip Nash had been for many years in the employment of the Indian Government, where he had done a great work in connection with the Indian Railway system. He suggested that that day's function should be described as a happy nuptial ceremony, for it represented the marriage of a small line with a very big line.

Major-General Sir Philip Nash, responding, said that Lord Churchill had been good enough to ask Sir Eric Geddes to be present at that luncheon, and it was only pressure of public business which prevented him from accepting. The railway which they had been over that morning provided one of those new facilities which were so necessary in order to solve what they knew as the London traffic problem. It was not merely a problem which affected the Underground railways, but it also affected the main line railways very considerably. The problem was more eloquently illustrated by figures than any other method. The population of London in 1902 travelled on an average 166 times in the year, whilst in 1918 the population of London travelled 385 times in the year.

Sir William Bull, M.P., proposing the health of the Chairman, congratulated the Great Western and the Central London Railway companies on behalf of Hammersmith for the new line which had been put through that district, and said it had been long needed. He always had the greatest admiration for the Great Western line and always thought it the finest line in the world.

The Chairman, responding, said that any success so far as his chairmanship of the Great Western Railway Company was concerned was entirely due to the loyal and whole-hearted support he had received, not only from his colleagues and the Deputy-Chairman, Sir Ernest Palmer, but from Mr. Aldington and other chief officers of the railway. He could not help referring for one moment to their old friend, the late General Manager, Mr. Potter, who took such a great interest in the line they had opened to-day.



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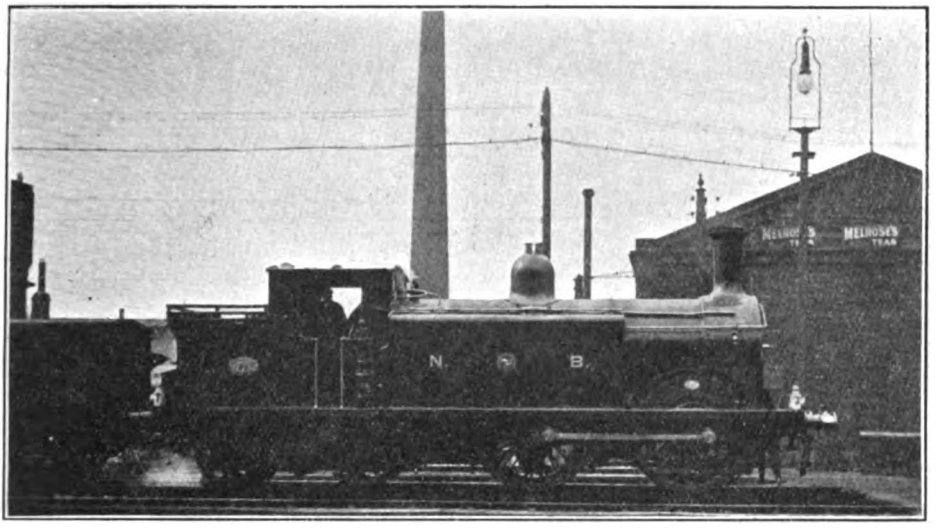

Photo] 0-4-4 TANK ENGINE NO. 91. [*C. E. S. Littlejohn.*

Designed by Mr. H. Holmes and built at Cowlairs 1888. Coupled wheels, 5 ft. 9 in. diam. Cylinders, 17 in. by 24 in.

Locomotive and Train Working in the latter part of the 19th Century.

NORTH BRITISH RAILWAY. [No. VI.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

RETURNING now to the Glasgow end of the North British system, a new line was constructed from Helensburgh northwards, which crosses the Callander and Oban Railway at Crianlarich, and extends for 140 miles from Helensburgh to Fort William and Mallaig. This railway, known as the West Highland, was leased to the North British, which guaranteed 3½ per cent. on the authorised capital. For working this line Mr. Holmes designed and built at Cowlairs a number of 4-4-0 engines with driving wheels of the small diameter of 5 ft. 7 in. The cylinders are 18 in. by 24 in., and the boiler pressure 150 lb. per sq. in. The total heating surface is 1,235 sq. ft., and the weight in working order 43 tons 6 cwt., of which 28 tons 6 cwt. is available for adhesion. The engines were designed for a load of 200 tons.

In 1893-4, twelve of these were built, followed in 1896 by another lot of twelve, and although most of them were employed on the West Highland line, some were to be found on other portions of the system. These engines are as follows :—

1893.—Nos. 693 to 698.
1894.—Nos. 699 to 701, 55, 393, 394.
1896.—Nos. 702 to 704, 227, 231, 232, 341 to 346.

The trains were, in summer, usually composed of three bogie saloon coaches, one through six-wheeled vehicle from Edinburgh and another from London, with one coach and van from Glasgow. The speed of the trains over the line was restricted by the Board of Trade to 25 m.p.h., excluding stoppages. This interesting line has been described on several occasions in the RAILWAY MAGAZINE.

In my account of the North Eastern Railway I have already mentioned the celebrated "locomotive quarrel" between

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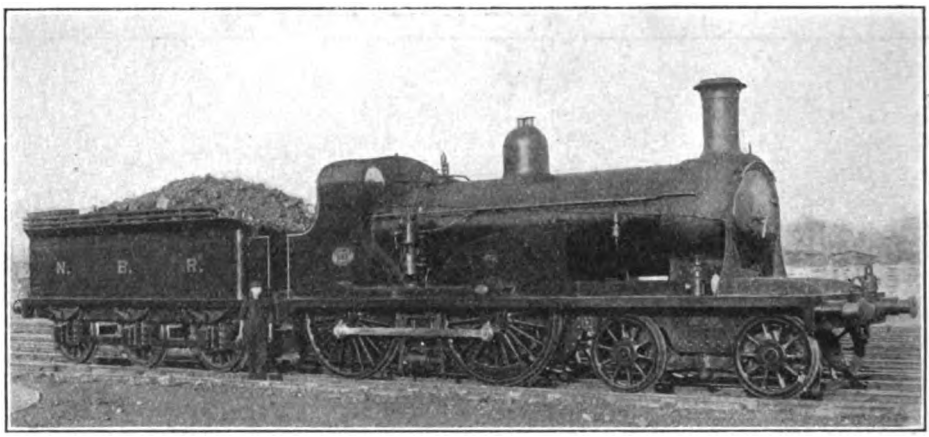

4-4-0 LOCOMOTIVE NO. 633.
Designed by Mr. M. Holmes and built at Cowlairs 1891, Coupled wheels, 6 ft. 6 in. diam. Cylinders, 18 in. by 26 in.

that Company and the North British. About 1894 the North British thought that there was no reason why they should not work the East Coast expresses between Berwick and Edinburgh with their own engines instead of leaving this duty entirely to the North Eastern, so they gave the latter company six months' notice to quit. The North Eastern objected strongly and brought the lawyers in, with the usual result of a very merry time for the latter. Finally a judgment was given in the House of Lords that no specific legal rights existed on either side and that if the two companies could not fix matters up amicably, they had better call in the Railway Commission. Pending a decision by the latter body, the North British decided to work all East Coast trains themselves, and from January 14, 1897, bundled out the North Eastern neck and crop. At the same time the North British guaranteed that all trains, despite the Berwick stop for changing engines, would keep the time as scheduled on the existing time-tables. This was somewhat in the nature of a rash promise in the case of those important trains which had been performing the through run between Edinburgh and Newcastle at a high rate of speed, for these trains had now to stop at Berwick and change engines, and yet arrive at Edinburgh or Newcastle as before. There were three of these trains, two down and one up, of which the down train covered the non-stop run of 124½ miles in 143 min., or at the rate of 52·2 m.p.h. The run from Berwick to Edinburgh, 57½ miles, would have to be done on the North British in 63 min., but in case the train were late the actual time was about 60 min. On the up journey, the time allowance to Berwick was 66 min., including the 4½ miles of 1 in 96 up the Cockburnspath bank, but this run might have to be done in 60 min. in case of delay at Edinburgh. Two engines were invariably used, since the North British were under an absolute pledge to run the trains to time, and the second engine was in the nature of a stand-by in case of need. The engines used were generally the 6 ft. 6 in. coupled engines of the 633 class (633 to 642, 213 to 216, etc.), and some very fine running was done. Thus on one occasion, with a load of 170 tons, the 57½ miles were covered in 57 min. 49 sec., including a slack to 15 m.p.h. at Dunbar, and on another with 168 tons in 57 min 21 sec. On the up journey, with 213 tons, Berwick was reached from Edinburgh in 58 min. 49 sec.

The up and down dining trains were allowed more time, although the loads were heavier, and were booked in 77 and 76 min. for the down, and 72 min. for the up trains. Consequently on these trains one engine only was employed. On the 2.20 p.m. from Edinburgh, with a load of 230 tons, the run to Berwick was made by one engine in 62 min. 37 sec., or nearly 10 min. under time. The

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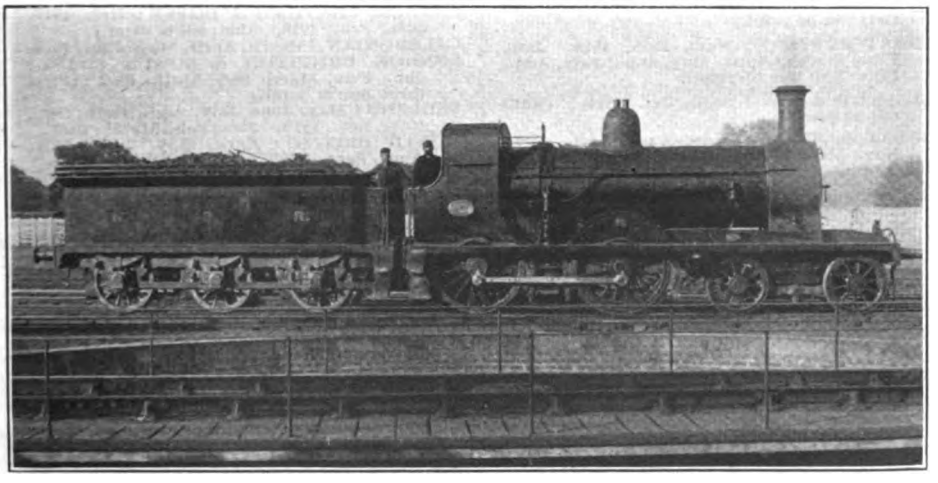
maximum speed down the Cockburnspath bank was 82½ m.p.h.

Occasionally the 7 ft. coupled engines 592 to 603 were used, and on one occasion No. 598 and 603, with a load of 185 tons, ran from Edinburgh to Berwick in 58 min. 22 sec., in spite of a strong gale. The 11 mile rise from Dunbar, which terminates in the long bank of 1 in 96 were covered in 11 min. 48 sec., and the 16½ miles from Grant's House to the stop at Berwick took only 14 min. 5 sec.

Early in 1898 an arrangement was arrived at with the North Eastern whereby each company worked certain of the trains, and the "match against time" ended.

In 1898, Mr. Holmes decided upon an enlargement of the 6 ft. 6 in. coupled class, having probably noted the great success of the Caledonian "Dunalastair" class with large boilers designed by his neighbour, Mr. J. F. McIntosh. Mr. Holmes also enlarged the cylinders of his new engines to 18½in. by 26 in., retaining the 6ft. 6 in. wheels. The pressure was increased to 175 lb., and the total heating surface to 1,350 sq. ft., of which the tubes provided 1,224 sq. ft., and the firebox 126 sq. ft. Of these new engines, Nos. 729 to 740 were built at Cowlairs in 1898, and 765 to 770 in 1899. Some of these engines were placed in service on the Waverley route to Carlisle, most of the work on which had hitherto been done by Mr. Drummond's "476" class. But whatever engines were employed the North British always seemed to develop much caution over this route, and, perhaps rightly so, the drivers seemed to be forbidden to make up time. But why powerful engines like the "729" class should have to make a special stop at Newcastleton for a bank engine, even with loads of about 140 tons, I never quite understood. Nevertheless, Mr. Rous-Marten recorded some excellent work by the "729" class between Edinburgh and Berwick, and stated that one of them with the up dining-car train of 240 tons, ran the 57½ miles in 61 min 40 sec., in spite of a loss of 1½ min. by signals after 55 miles had been run in 57½ min. A speed of 33 m.p.h. was maintained up the Cockburnspath bank of 1 in 96. On another occasion a speed of 82·4 m.p.h. was attained on a falling gradient.

In 1900 the last year of the century, the timing over the Waverley route was not so fast as it had been more than 20 years earlier, for the fastest down train, the night Scotch express, was scheduled to run from Carlisle to Edinburgh in 2 hours 24 min., but in this case with two conditional stops. The fastest up train, the 10.5 a.m. ex-Edinburgh, reached Carlisle at 12.38 p.m. with three stops. But shortly afterwards a through run from Carlisle to Edinburgh in 2 hours 15 min. was on record in the



4-4-0 LOCOMOTIVE NO. 698, FOR SERVICE ON THE WEST HIGHLAND RAILWAY.

Designed by Mr. M. Holmes and built at Cowlairs 1894.

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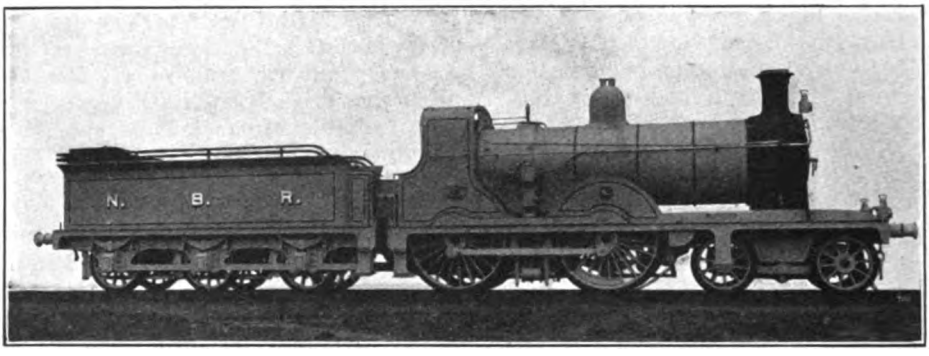

4-4-0 ENGINE NO. 729.

Designed by Mr. M. Holmes and built at Cowlairs 1898. Coupled wheels, 6 ft. 6 in. diam. Cylinders, 18½ in. by 26 in.

time-tables. Some improvement had also been made between Edinburgh and Glasgow. The connection with the 8.15 p.m. from King's Cross ran from Edinburgh to Cowlairs in 57 min., and several of the Glasgow to Edinburgh trains were timed right through in 65 min., inclusive of a stop at Haymarket. This brings me to the end of the North British narrative, for the fine modern engines designed by Mr. Reid all belong to the present century, and consequently, do not enter within the limits of this series of articles.

Locomotive and Train Working in the Latter Part of the Nineteenth Century.

Railways already dealt with in the "Railway Magazine" by Mr. E. L. Ahrons are:—

L. & N.W.: Jan., Feb., March, May, 1915. (All out of print.)

GREAT NORTHERN: June, July, 1915. (Both out of print.)

MANCHESTER, SHEFFIELD & LINCOLNSHIRE: Aug., Sept., Oct., 1915. (Aug. and Oct. out of print.)

GREAT WESTERN: Nov., Dec., 1915. Jan., Feb., March, April, May, June, July, Aug., 1916. (All out of print.)

GLASGOW & S.W.: Sept., Oct., 1916. (Both out of print.)

GREAT EASTERN: July, Aug., Sept., Oct., Nov., Dec., 1918. (Dec. out of print.)

NORTH EASTERN: Nov., Dec., 1916. Jan., Feb., March, April, May, 1917. (All out of print.)

SOUTH EASTERN: June, July, Aug., 1917.

LANCASHIRE AND YORKSHIRE: Sept., Oct., Nov., 1917.

LONDON, CHATHAM & DOVER: Dec., 1917. Jan., Feb., 1918. (Jan. out of print.)

CALEDONIAN: March, April, May, June, 1918.

LONDON BRIGHTON & SOUTH COAST: Jan., Feb., March and April, 1919. (First three out of print.)

MIDLAND: May, June, July, Aug., Sept., Oct., Nov., Dec., 1919. Jan., Feb., March, 1920.

NORTH BRITISH: April, May, June July, Aug., Sept., 1920.

All parts still in print are One Shilling each.

In "Railway Magazine," October, 1920, Mr. Ahrons will commence a series of articles on the London & South Western Railway.

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Dynamics Concerning Railways.

By DONOVAN H. LEE.

THE dynamics which concern railways are exceptionally interesting and very simple to grasp even by readers without any taste for mathematics. It is really surprising how much can be simply explained by dynamics.

Very few people see any connection, however, between the dynamics of mechanics, and the motion of trains. Some while ago it was stated in this magazine that up Great Western expresses often run from Southall to a stop at Paddington without any steam on, a distance of nine miles. On remarking this to a friend the reply was: "Oh! I suppose that is because they come such a long way before shutting off." Now readers will readily see that the kinetic energy which decides the distance the train will run before stopping has no connection with the distance from the start, but depends only on the mass and on the velocity squared.

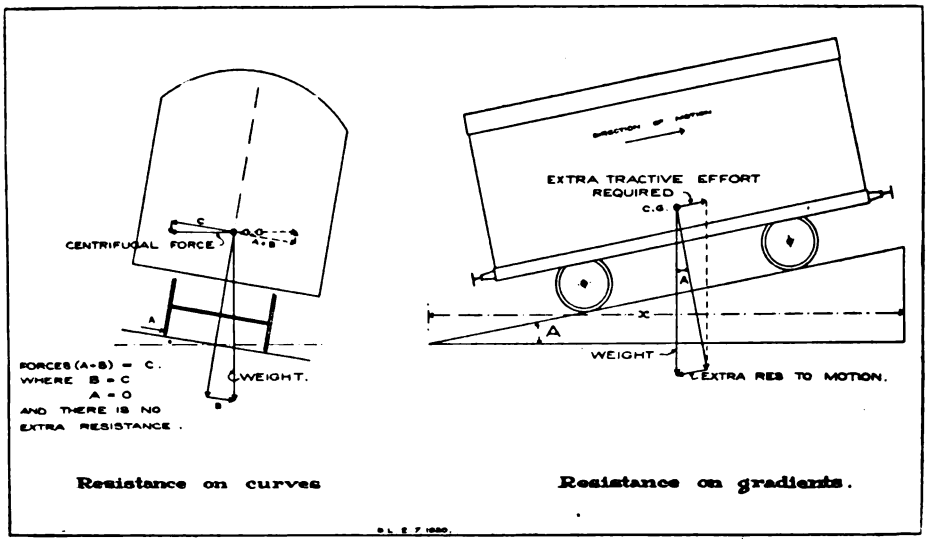
The constant force retarding the train depends chiefly on the coefficient of friction at low velocities, this determining the power that is required to haul a given load.

The coefficient of friction is really the ratio of the horizontal force required to move the train on the level to the weight moved.

As far as railways are concerned, it is usually expressed in lb. per ton. It varies considerably, but, quoting some tests made on the Illinois Central Railroad, it is between 4¾ lb. and 14¾ lb. per short ton (according to the type of stock hauled), the speed, the axle loads, and the condition of track. Speed alone being varied, the total resistance is lowest at about 10 to 15 m.p.h.

Higher axle loads also tend to decrease resistance and light section rails on the other hand tend to increase it. For a nearer approximation 7 to 8 lb. per ton for a velocity of 20 m.p.h. is perhaps the average.

Gradients, however, do not alter the



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coefficient of friction, but the total resistance is increased by the component of the weight parallel to the rails.

This is given by :

Extra resistance—R=W.Tan.A.

or = Weight × Gradient.

If the gradient is not known in the 1/X form, but in the American per cent. form, then R = 22.4 × G, where G = per cent. of gradient.

To start a train from a standstill, there are other resistances, a considerably greater tractive effort being required. This is mainly due to the fact that the static friction of the bearings is greater than the kinetic friction.

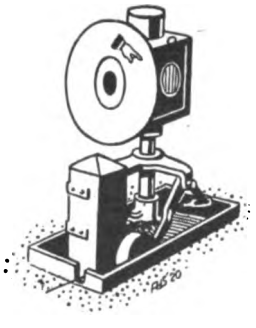
This is especially so if the oil should be congealed. Then there is also the kinetic energy of the train which has to be supplied from the start, in fact, reader, I expect you are wondering at this stage how trains ever manage to go. There are many mitigating circumstances though. The kinetic energy, which is the stored energy of a train in motion, increases with the square of the velocity, but at low speeds, this is not of importance. To counteract this the static friction is only of importance at the very start, while the extra resistance due to the oil films not being perfect in the bearings is only existent at low speeds, varying, of course, with the diameter of the wheel. It is clearly seen then that the hardest effort is distributed over a longer interval than would be supposed.

The interval being shortened in the case of the high accelerations of electric trains, means that the tractive effort must be considerably greater. This extra work is not lost, being merely compressed into a shorter time, Of course, where the maximum tractive effort is limited, the acceleration is also limited. This is where electric traction has the great advantage for suburban work.

To go into figures again, a reasonable resistance at the very start would be about 15 lb. per ton. Altered conditions would affect this enormously. To back the engine on to the train for a few feet so as to compress the buffers, decreases the initial tractive effort required, this being accentuated by the fact that the couplings then being slack the last carriages are not started immediately.

When a train is running on a curve there is a centrifugal force outwards, exerting an increased pressure on the outer rail which is supplied by the engine power. When this force is equal to the tractive effort, the train resistance is, of course, double. It very quickly becomes so, being double at about 450 ft. radius. Super-elevating the outer rail gives a component of the weight of the train to counteract the centrifugal force, this practically neutralizes the centrifugal force and reduces the total resistance. It is, nevertheless, easily seen that the train must be travelling at one certain speed to make the centrifugal force equal to the component of the weight acting against it.

Above or below that speed there is pressure on the side of one of the rails and a consequent increase in resistance to motion.



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GOODS WAREHOUSE, NORTH MERSEY.

The Liverpool Goods Stations of the Lancashire and Yorkshire Railway.

IN connection with the trade of Liverpool the position of the Lancashire and Yorkshire Railway is essentially an important one. In the city itself and its environs the company possesses six main stations for handling merchandise of all kinds, and several smaller depôts. With one exception the stations are situated in close proximity to the docks, the southernmost being the South Docks goods depôt, and the northernmost the North Mersey and Alexandra Dock station.

A chief function of the Lancashire and Yorkshire Railway in Liverpool is to distribute throughout the North of England the great store of foodstuffs, cotton, wool and other raw materials landed from abroad; and in the reverse direction to bring down the manufactured textiles, machinery, ironwork, &c., for export, and coal both for export and for the bunkering of mercantile fleets.

With this object the railway company has provided six large general merchandise stations, extending about six miles parallel with, and in close proximity to, the Mersey Docks Estate, and to the warehouses, flour and oil cake mills, sugar refineries, &c., which contribute so largely to the welfare of the port.

Each of these goods depôts is constructed with covered quays or stages for dealing with every class of general merchandise, also with storage accommodation for goods to "wait order," and well equipped with cranes, hoists, capstans, &c., driven either electrically or by hydraulic power. In addition several stations have exceptional facilities for handling specific traffics peculiar to the neighbourhood in which they are respectively situated. For instance, the most recently opened station —Wapping and Salthouse—is surrounded, save on the dock side, with warehouses for the storage of cotton, wool, provisions, groceries, fruit, &c., and to ensure the prompt unloading of carts ample stage

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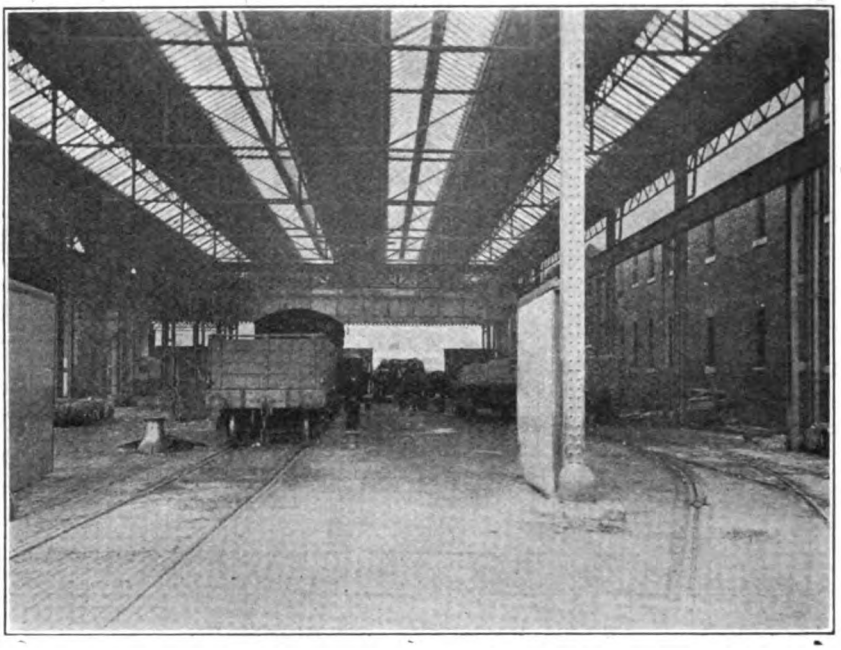
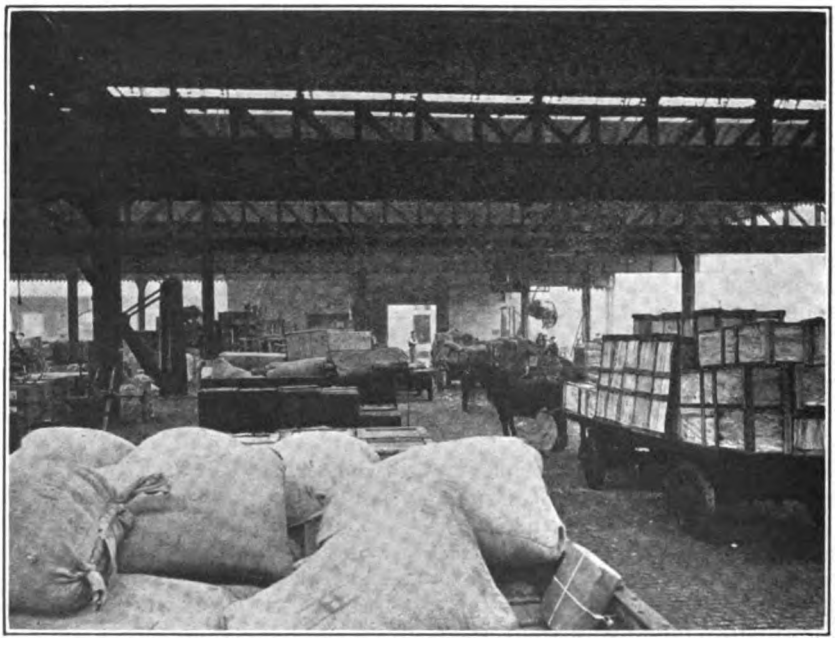


INTERIOR VIEW IN ONE OF THE SHEDS.



ANOTHER PART OF THE DEPOT.

WAPPING AND SALTHOUSE GOODS WAREHOUSE.

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accommodation has been provided, together with electric cranes and traversers of 15 to 30-cwt. capacity, having both longitudinal and transverse action.

The Wapping and Salthouse station is situated about midway in the line of docks and adjacent to the docks themselves. It is served by the Lancashire and Yorkshire Railway from the main line at Fazakerley Junction, where extensive sidings exist, and are provided for the exchange of goods and coal traffic. In the same vicinity there is situated another important group of sidings, namely, the Aintree marshalling sidings, comprising 18 miles of track. Indeed, the entire system of lines entering the Liverpool dock area is one which permits of free traffic circulation therein.

From the Aintree sidings the lines branch off and lead to the North Mersey, Bankfield, North Docks, Wapping and South Docks stations, there being free communication from one end to the other of the range of docks below the Liverpool Overhead Railway, with connections to each station.

Wapping and Salthouse Depôt was opened in the year 1902, when it dealt principally with full-load traffic, consisting mainly of cotton, averaging 4 tons per consignment. With the improvements afterwards effected by introducing electric overhead cranes of varying capacities from 15 cwt. to 30 cwt., it was made possible to handle any load promptly and efficiently from a ton upwards.

The traffic to-day is of an entirely miscellaneous character, both import and export, but primarily cotton, grain and foodstuffs. This station also deals with a heavy volume of traffic from the centre of Liverpool, and the weight handled averages 450 tons per day. The building contains six sets of rails with two stages alongside in one yard, and in the other two lines of track without stages. There are two main buildings, one of much more recent construction. Cranes run across the building in the old yard and longitudinally in the new one. In the latter case packages can be picked up from any position and deposited in another by means of the crane installation. Traffic is conveyed from the ship side to the station on drays and loaded there into the railway wagons by overhead and stationary cranes.

The arrangements in this new portion of the station are entirely up-to-date. After being loaded at this point the wagons proceed by the dock lines to the North Docks station and thence direct to Aintree, where they are marshalled in train order and despatched to destination.

There are two 30-cwt. electric overhead cranes and one 15-cwt. in the new building, and one of each class in the older building. In addition there are two electric hoists, each of 10 cwt. capacity, and the other equipment of the station comprises an hydraulic crane installation, including one of 7 tons and two others of 30 cwt., with light lifts of 10 cwt. There are eight capstans, three of which are electrically driven and the remainder hydraulically operated. Power is obtained from the Liverpool Corporation, the station being situated too far from the Lancashire and Yorkshire Railway's electrical power house to enable the current therefrom to be economically transmitted. The stations at North Docks and North Mersey both obtain electricity from the company's power station at Formby.

The bulk of the miscellaneous small traffic now handled at the Wapping goods station was originally dealt with at the Victoria Street depôt and carted by teams to North Docks, but in December, 1914, Victoria Street depôt was closed and deliveries have since been made to Wapping and Salthouse station direct. This resulted in considerably expediting the handling of goods traffic by reducing the number of transfers to the minimum.

The Lancashire and Yorkshire Railway conveys large quantities of cotton from Liverpool to the manufacturing towns in Lancashire. Apart from that loaded up direct on the Dock Estate of the Mersey Docks and Harbour Board, a heavy tonnage is carted into the company's depôts along the line of docks, where it is lifted off lorries and loaded in wagons by electric overhead cranes.

As illustrating the importance of cotton to the Lancashire and Yorkshire Railway, it may be mentioned that it is carried in one form or another at least four times over the railway, *e.g.* :—

1. As raw cotton from Liverpool to the Oldham district.

2. After being spun into yarn it is conveyed from the Oldham district to

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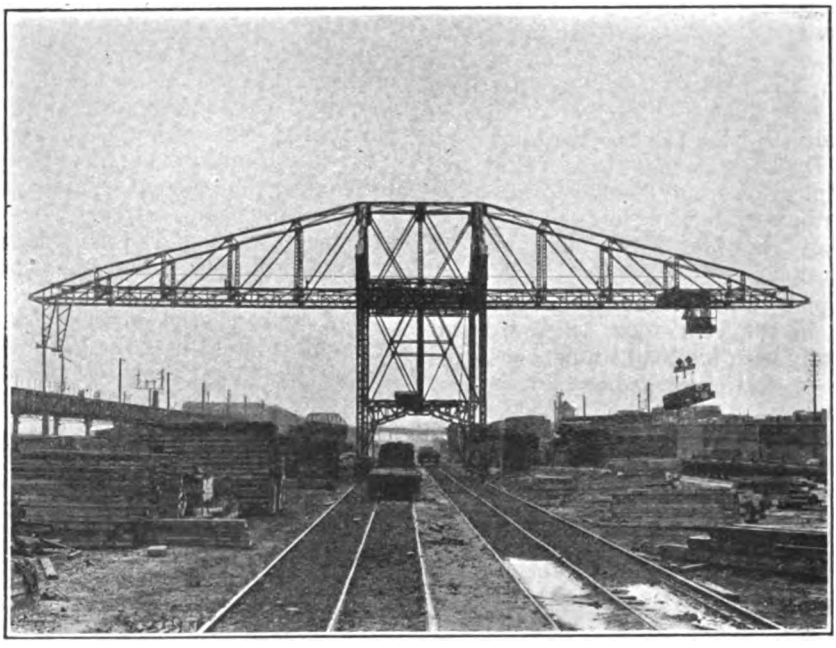
such places as Blackburn, Burnley and Nelson, to be woven into cloth.

3. The cloth is then conveyed in the "grey" to Manchester, being loaded up on what are known as "flatbottoms" at the mills. These are bodily transferred by overhead cranes to wagons at the sending station and also discharged by cranes to lorries and delivered at the Manchester warehouses.

4. After being sold the cloth is re-despatched to the Lancashire towns where bleaching and printing are carried on. After completing this work the cloth is again conveyed in its finished condition to the various warehouses for home sale, or to the ports of Liverpool and Manchester for shipment abroad.

North Mersey and Alexandra Dock station is at the extreme north end of the docks, and is a fine specimen of a modern goods depôt provided with two covered quays, spacious both in length and breadth, where cotton, grain, wool, &c., for despatch and manufactured goods for export are dealt with in large quantities. There is also a spacious warehouse with four floors, lofty rooms, patent fireproof doors and hydraulic lifts. This warehouse was practically monopolised during the war by Government departments for the storage of various commodities.

In the yard north of the station there is installed a high capacity cantilever crane, the only one of its kind in Liverpool. This crane was erected in 1908 to meet the needs of the timber trade, and has a longitudinal run of 540 yards with a transverse span of 172 ft., and the lifting capacity of 10 tons. Its utility is very great, the crane being able to pick up a heavy load of timber at one end of the crane-race and deposit it at any point within the great rectangle of its sweep, in a period measured almost in seconds. This unique and costly equipment is much appreciated, plots for the storage of timber at North Mersey station being keenly competed for. Another interesting feature is that the hydraulic power for working the cranes and capstans is generated, not by steam, but by electric current drawn from the power station at Formby, which supplies the current for the working of the Liverpool, Southport and Crossens, and Liverpool and Ormskirk lines. The North Mersey depôt adjoins the extensive granary belonging to the Liverpool Grain



10-TON CANTILEVER CRANE, NORTH MERSEY.

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Storage and Transit Company, which is connected with the station by rail, and it is also the nearest goods yard to the Gladstone Dock, where the largest Atlantic liners are usually berthed when in Liverpool. Large numbers of American troops were dealt with at North Mersey on their arrival in this country ; also wounded and convalescent soldiers returning to the United States of America.

Bankfield and Canada Dock depôt is another station which deals with a considerable timber traffic, and has a 10-ton travelling crane for handling that commodity, also a Goliath crane of 40-tons capacity for lifting boilers, locomotives, engines, &c.

At the North Docks depôt there are extensive cattle sidings, where the bulk of the Irish live-stock landed in Liverpool was formerly dealt with, the trade sometimes exceeding 250 wagons of cattle, sheep, &c., in a day ; but some years ago the serious outbreak of " foot-and-mouth " disease led the Government to order all live-stock to be discharged at Birkenhead and quarantined.

Great Howard Street is the chief station for inward town traffic and South Docks caters for the docks at the south end of the port.

All the stations deal with traffic arising from up-country for export from the docks in their respective neighbourhoods ; and in addition to the traffic handled there, large quantities of goods, both import and export, pass through North Docks, Bankfield and North Mersey in full truck loads to and from the Dock Estate, where they are loaded or unloaded direct at the ship's side.

Wagons loaded at South Docks and Wapping and Salthouse stations pass along the dock line of railway to North Docks, and therefrom they are sent to the marshalling sidings at Aintree (consisting of 18 miles of track), where the wagons from all Lancashire and Yorkshire stations in Liverpool are centralised and marshalled for despatch. The sidings at Aintree likewise form the terminus for inward Liverpool goods trains ; the trains being dissected there and the wagons sent down to their respective depôts by pilot engines.

The Lancashire and Yorkshire Company

COTTON QUAY, BANKFIELD.

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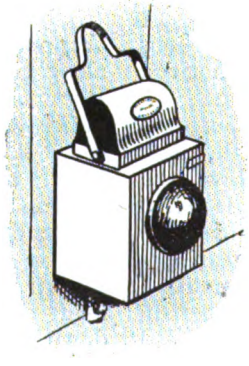
CATTLE PENS, NORTH DOCKS.

ranks as the largest railway coal carrier to Liverpool, the quantity brought in for export and for bunkering the port's mercantile fleets at the Mersey Docks and Harbour Board high level and Canada Dock coal tips amounting to 2,000,000 tons per annum, in addition to the substantial quantities required for industrial concerns, gas works and household consumption. To meet the requirements of this trade sidings have been laid down at Sandhills and Fazakerley to accommodate upwards of 3,000 wagons; and special train services are provided, with the result that thousands of tons of coal raised at South Yorkshire pits one day are regularly put on board ships at Liverpool the day following.

Facilities for visiting the various stations referred to above were kindly granted the writer by Mr. H. Marriott, Chief Goods Manager of the Lancashire and Yorkshire Railway.



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Summer Train Services in 1920.

By "VOYAGEUR."

TWO summers have elapsed since the Armistice, and the time has come round again for reviewing the progress made in the restoration of British and Irish main line time-tables to an appearance at least comparable with those of pre-war days. Numerically—that is, in the number of express trains now operating—progress has been remarkably rapid, if we take into account the serious handicaps of shortage of locomotives and rolling-stock from which most of the leading companies are still suffering. But to produce figures which would show in a clear and concise way the improvement in "density" of express train services is an almost impossible task; suffice it to say that the bulk of pre-war expresses, with the exception of a few of the "crack" competitive trains, have now reappeared in more or less recognisable form. In these days when economy in operation is imperative, it is unlikely that the lost "fliers" referred to—excellent for purposes of advertisement, but of doubtful wisdom as sources of revenue—will ever be restored to the time-tables at all; certainly not for a long time to come. Post-war progress all round in the matter of railway speed, indeed, lags a long way behind the advances which have been made towards pre-war standards of frequency and comfort in express train travel.

As it is difficult to strike an average really representative of long-distance journey times, Table A is compiled on the basis of the fastest times in operation between London and the chief towns in Great Britain. Compared with those at present in force are shown those which obtained at the time of the Armistice and those prior to the war, with details of the increase in time from 1914 to 1918, and the subsequent decrease. In the great majority of cases, the latter figures are very much smaller than the former. Calculated in percentages, which afford perhaps the most telling way of making the comparison, the Armistice times show an average decline of 23.3 per cent. on pre-war times, while times now operating still average 13.6 per cent. below those in force before the war. An examination of the table in this way also shows how varied has been the practice of the different companies as regards war decelerations and post-war accelerations. To the towns shown in the table the Midland fell off in speed by 28.8 per cent., but has now recovered to an arrears in time of only 13.6 per cent. On the other hand, the Great Central Railway, which slowed its best trains in a lesser degree during the war than any other of the large companies—to the extent of only 9.4 per cent. to the towns in the table—is still 9.4 per cent. behind pre-war times, having made no appreciable post-war improvements in time.

By far the best results since the war have been accomplished by railways running services which are mainly non-competitive; the Great Western, for example, was 19.1 per cent. down at the worst period, but is now only 7.6 per cent. down, while the Great Eastern, South Eastern and Chatham, and London, Brighton and South Coast Companies, taken collectively, average 36.6 per cent. slower in 1918 than in 1914, but only 9.7 per cent. slower in 1920. All these are rough figures calculated from this table alone, but are fairly accurate as a summary of time-table changes during the six years under review. Perhaps the most unedifying commentary on the hampering effect of time agreements between competing companies is seen in the fact that while Birmingham is still 25 per cent. further in time from London, Liverpool 25.6 per cent., Manchester 22.8 per cent. by Midland and no less than 28.6 per cent. by North Western, and Leeds 22.3 per cent by Great Northern, than in 1914, the best time to Margate is within 2.2 per cent., Cardiff 2.9 per cent., Penzance 3.9 per cent., Norwich 5.5 per cent., Exeter (Great Western) 6.2 per cent., and Plymouth 6.5 per cent., of those operating in pre-war days. Since last year's table, the most substantial

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accelerations effected have been those of the Midland Railway to every town that it serves; elsewhere there is not much to note save gains of 30 min. to Glasgow (West Coast), 25 min. to Hull, 20 min. to Newcastle, 16 min. to Bradford (Great Northern), and 15 min. to Whitehaven. Plymouth by London and South Western route (which now is hardly treated as a seriously competitive route from London) is 13 min. further off than last year, Aberdeen 8 min., and Margate 2 min.

In the matter of non-stop runs exceeding 100 miles in length, there has, however, been a distinct advance since last summer. The Great Western Railway now assumes the lead, with 20 such runs daily, including the familiar journey of the 10.30 a.m.

TABLE A.—FASTEST TIMES BETWEEN LONDON AND PROVINCIAL TOWNS IN 1914, 1918 AND 1920.

Town.	Distance	Aug., 1920. Fastest Time.	Direction.	Railway.	Aug. 1914. Fastest Time.	Oct., 1918. Fastest Time.	Increase 1914–1918.	Decrease 1918–1920.
	miles.	h. m.			h. m.	h. m.	h. m.	h. m.
Aberdeen	523½	12 53	Down	East Coast Rlys. ...	11 05	13 30	2 25	0 37
Birmingham ...	110½	2 30	Both	G.W.R.	2 00	2 30	0 30	Nil
,, ...	113	2 30	,,	L. & N.W.R.	2 00	2 35	0 35	0 05
Bournemouth ...	108	2 31	Down	L. & S.W.R.	2 00	2 39	0 39	0 08
Bradford	193¼	4 29	,,	G.N.R.	3 56	4 50	0 54	0 21
,, ...	203½	4 52	Up	Midland R.	4 13	5 55	1 42	1 03
,, ...	208	4 54	,,	G.C & L. & Y. Rlys ...	4 42	5 00	0 18	0 06
Brighton	51	1 05	Dowr	L.B. & S.C.R.	1 00	1 15	0 15	0 10
Bristol	117½	2 15	Both	G.W.R.	2 00	2 15	0 15	Nil
Cardiff	145¼	2 55	Down	,, ...	2 50	3 10	0 20	0 15
Carlisle	299	6 32	,,	L. & N.W.R.	5 48	6 45	0 57	0 13
,, ...	308¾	6 45	,,	Midland R.	6 05	7 28	1 23	0 43
Edinburgh ...	393	8 48†	,,	East Coast Rlys. ...	7 45	9 40	1 55	0 52
Exeter	173¾	3 13	Up	G.W.R.	3 00	3 30	0 30	0 17
,, ...	171¾	3 50	Down	L. & S.W.R.	3 14	3 57	0 43	0 07
Glasgow	401½	9 00	,,	West Coast Rlys. ...	8 00	9 30	1 30	0 30
,, ...	424¼	9 45	,,	M. & G. & S.W. Rlys.	8 45	10 40	1 55	0 55
Harrogate ...	198¾	4 40	Up	G.N. & N.E. Rlys. ...	4 00	5 20	1 20	0 40
,, ...	*214½	5 24	Down	Mid. & N.E. Rlys. ...	4 30	6 05	1 35	0 41
Hull	196¾	4 25	Up	G.N. & N.E. Rlys. ...	3 52	4 55	1 03	0 30
Inverness	567¾	14 45	Down	West Coast Rlys. ...	12 50	15 55	3 05	1 10
Leeds	185¾	4 10	Both	G.N.R.	3 25	4 32	1 07	0 22
,, ...	196	4 15	,,	Midland R.	3 40	4 47	1 07	0 32
Leicester	99	1 58	Up	,, ...	1 45	2 15	0 30	0 17
,, ...	103	1 56	Down	G.C.R.	1 49	1 56	0 07	Nil
Liverpool	192¼	4 30	Both	L. & N.W.R.	3 35	4 45	1 10	0 15
Manchester ...	188¾	4 23‡	Up	,, ...	3 30	4 35	1 05	0 12
,, ...	189½	4 30	Both	Midland R.	3 40	5 08	1 28	0 38
,, ...	212	4 45	,,	G.C.R.	4 10	4 45	0 35	Nil
Margate	74	1 32	Dowr	S.E. & C.R.	1 30	2 03	0 33	0 31
Newcastle ...	268½	5 35	,,	G.N. & N.E. Rlys. ...	5 13	5 55	0 42	0 20
Norwich	115	2 34	,,	G.E.R.	2 26	2 54	0 28	0 20
Nottingham ...	123½	2 26	,,	Midland R.	2 12	2 55	0 43	0 29
,, ...	126½	2 27	,,	G.C.R.	2 23	2 27	0 04	Nil
Penzance	305¼	6 45	,,	G.W.R.	6 30	7 55	1 25	1 10
Perth	449¾	10 18	,,	West Coast Rlys. ...	9 00	11 05	2 05	0 47
Plymouth (N. Rd.)	225¾	4 23	,,	G.W.R.	4 07	5 00	0 53	0 37
,, ...	230¾	6 13	Both	L. & S.W.R.	4 55	5 55	1 00	*0 18
Sheffield	164¾	3 22	Down	G.C.R.	2 57	3 22	0 25	Nil
,, ...	158½	3 37	Up	Midland R.	3 00	4 01	1 01	0 24
Stoke-on-Trent ...	145½	3 12	Down	L. & N.W.R. & N.S.Rs.	2 41	3 21	0 40	0 09
Whitehaven ...	311	8 10	Up	L. & N.W. & Furness R	7 45	9 05	1 20	0 55
Yarmouth... ...	121¾	2 57	Down	G.E.R.	2 30	3 58	1 28	1 01
York	188	4 00	,,	G.N.R.	3 35	4 00	0 25	Nil

† Working Time; published time, 9h. 0 min.
‡ Working Time; published time, 4h. 30 min.
*18 min. *deceleration*.

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'Cornish Riviera" express from Paddington, which not only takes the palm for length in Great Britain, but also in the world. New runs appear this year from Paddington to Torquay and Newton Abbot to London (both have figured in summer time-tables before the war), while Paddington-Worcester and Paddington-Bristol (*via* Bath) reappear as non-stop journeys. It is very much to the credit of the Great Western Railway that all the runs figuring in this table are scheduled at over the 50 m.p.h. limit. Next comes the Great Northern Railway, all of whose runs but one are made over the same course; the total in this case is 77 per cent. of the pre-war figure. The London and North Western total is 2 below that of last year, a large number of the nominally non-stopping expresses continuing to make special calls, not advertised, for working purposes only. Thus the 10.10 a.m., 5.20, 7.15 and 11.30 p.m. Euston-Crewe call intermediately at Rugby at 11.49–11.54 a.m., 7.1–7.4, 8.55–8.58 p.m., and 1.12–1.15 a.m., respectively; the 4.5 a.m. Crewe-Euston and the 4.26 a.m. Crewe-Willesden at the same place at 5.37–5.40 and 5.57–6.0 a.m.; the 9.20 p.m. Euston-Carlisle makes a halt at Crewe at 12.40–12.50 a.m.; the 12.30 a.m. Carlisle to Crewe stops at Carnforth at 2.0–2.2 a.m.; and Preston is the stopping place of the 12.45 and 1.10 a.m., and the 10.40 p.m. from Carlisle to Crewe, the respective times being 2.48–2.51 and 3.10–3.12 a.m., and 11.47–11.50p.m. Were all these trains included the London and North Western total would be up to 25. Newcastle-Edinburgh runs on the North Eastern Railway are in excess by one of the regular daily pre-war figure.

It is pleasant to see the Great Eastern Railway reappearing in the "100-mile" list; in addition to the runs shown, there are frequent week-end non-stop journeys by special relieving trains between Liverpool Street and Yarmouth, 121.8 miles, but as these are not made daily they are not included in the table. On the Great Central Railway, the omission of Woodford and Brackley stops on the 6.10 p.m. Bradford express *ex* Marylebone adds a third and longest journey to the Great Central list. It is a pity that the Midland distance to Leicester from London falls short of the requisite figure by only one solitary mile, as its inclusion in the table would add no fewer than 14 non-stop runs between these points. Two "non-stops" between Leicester and Leeds, 97 miles, also come very near to inclusion. As it is, however, two runs between London and Nottingham are strictly the only ones that can appear; the 8.50 and 9.5 p.m. Scotch expresses *ex*-St. Pancras make regular, and not conditional stops at Kettering. The Caledonian Railway has a large number of runs apparently exceeding 100 miles in length, from Carlisle northwards, but of these the 4.10 a.m. *ex*-Carlisle is the only one which is not booked definitely to stop either at Beattock or Summit for engine requirements. This train, however, has four conditional calls, and so is not likely often to make the non-stop run. The 9.45 p.m. from Glasgow to Carlisle is a scheduled non-stop express. Only the London and South Western Railway is left as a railway which had 100-mile runs in its time-tables before the war, but no longer does so. Totals this year are nearly 30 per cent. above those of last year—72 against 56—and over one-half those of pre-war days. For purposes of more accurate comparison, I may say that I have cut out of the pre-war totals all the runs made by slip coaches, and also all the Sunday or other occasional runs, so that the figures given represent the everyday running during the summer. In view of the shortening of the hours of the staff to an eight-hour limit, the fact that 52 per cent. of the pre-war 100-mile runs are again operating is highly creditable.

Table C is the complement of Table B in respect of those railways which do not reach three figures. There are no particularly notable alterations from last year's figures, other than the re-introduction of non-stop running between Kilmarnock and Carlisle on the Glasgow and South Western Railway, and the Dublin-Dundalk run of the Great Northern Railway of Ireland—the only booking at over 50 m.p.h. in the table. The Lancashire and Yorkshire "longest" is one of a number of seasonal trains of its kind, centreing on the popular resorts of Blackpool and Southport; the longest *daily* run of this character is from Hebden Bridge to Lytham, 48.4 miles, over the same route as far as Kirkham, except for

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TABLE B.—NON-STOP RUNS IN AUGUST, 1920, EXCEEDING 100 MILES.

Railway.*	Runs between	Distance.	No. of Runs	Time.	Speed.	Fastest Train.	Total No. of Runs. 1919	1918	1914
		Miles.		Min.	m.p.h				
G.W.R. ... (225.7)	Paddington–Plymouth	225.7	1	263	51.5	10.30 a.m., D.	20	6	33
	Paddington–Torquay	199.7	1	229	52.3	12 noon, D			
	Newton Abbot–Paddington	193.9	1	220	52.9	12.25 p.m., U.			
	Paddington–Exeter ...	173.7	2	193	54.0	1.47 p.m., U			
	Paddington–Taunton	142.9	4	158(*m*)	54.3	4.0 p.m., D			
	Newport—Paddington	133.4	1	160	50.0	10.25 a.m., U			
	Severn Tunnel Junct.–Paddington	123.6	2(*g*)	148	50.1	3.52 p.m., U			
	Paddington–Worcester	120.5	1	135	53.6	1.30 p.m., D			
	Paddington–Bristol(*a*)	118.3	1	135	52.6	11.15 a.m., D			
	Bristol–Paddington(*b*)	117.6	2	135	52.3	(*o*)5.10 p.m., U			
	Paddington–Bath ...	106.9	3	119	53.9	6.30 p.m., D			
	Reading–Taunton ...	106.9	1	123	52.1	2.42 p.m., D			
G.N.R. ... (175.7)	Clifton Junct. (*c*)–Peterborough	112.1	1	149	45.1	9.58 a.m., U	17	6	22
	King's Cross–Grantham	105.5	16	124	51.0	5.30 p.m., D			
L. & N.W.R. (209.3)	Euston–Chester ...	179.3	1(*h*)	218	49.4	(*h*)8.40 p.m., D	14	10	41
	Euston–Crewe ...	158.1	4 (*k*)	193	49.2	8.45 p.m., D			
	Crewe–Willesden Junc	152.7	1	181	50.6	2.1 a.m., U			
	Crewe–Carlisle ...	141.0	5	182	46.5	1.0 p.m., D			
	Euston–Stafford ...	133.6	1	170	47.2	4.45 p.m., D			
	Bletchley–Crewe ...	111.4	1	136	49.1	12.9 p.m., D			
	Crewe–Holyhead ...	105.8	1(*l*)	130 (*l*)	48.8	1.12 a.m., D			
	Wigan–Carlisle ...	105.3	1	137	46.1	12.1 a.m., D			
N.E.R. ... (124.4)	Newcastle–Edinburgh	124.4	9	150	49.8	11.21 a.m., D	9	3	8
G.E.R. ... (130.2)	Liverpool Street–North Walsham	130.2	2	170	46.0	12.25 p.m., D	5	—	7
	Liverpool St.–Beccles	109.2	3	146	44.9	9.55 a.m., D			
G.C.R. ... (164.7)	Marylebone–Leicester(*e*)	107.6	1	123	52.5	6.10 p.m., D	3	2	4
	Marylebone-Leicester(*f*)	103.1	2	116	53.3	3.15 p.m., D			
Midland R. (206.0)	St. Pancras–Nottingham	123.5	2	146	50.8	9.15 a.m., D	2	—	15
Caledonian R (111.0)	Glasgow–Carlisle ...	102.3	2	155(*n*)	39.6	9.45 p.m., U	2	—	4
L. & S.W.R. (108.0)	—	—	—	—	—	—	—	—	4
Totals							72	27	138

* Figures in brackets in this column indicate longest runs performed daily in 1914 (in miles) (*a*) *via* Bath. (*b*) *via* Badminton. (*c*) York. (*e*) *via* Wycombe. (*f*) *via* Aylesbury. (*g*) One run includes additional stop at Badminton, leaving a run of 100 miles thence to Paddington if stop is made. (*h*) Runs when required only; not included in totals. (*k*) 5 runs on Saturdays. (*l*) 8.40 p.m. from Euston, when run, performs this journey in 129 min; on such days there are two runs of this length. (*m*) Actual fastest time: 157 min. by slip coach off 12 noon down. (*n*) Fastest time 140 min., by 7.55 p.m. Carlisle-Glasgow, but this includes daily stop at Beattock for locomotive purposes. (*o*) Also at 12 noon in same time. D, down. U, up.

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taking the direct line at Preston. On the East and West main line the longest run is the reinstated Manchester-Wakefield journey of 48 miles, by the 11.20 a.m. *ex*-Victoria. The Cambrian Company has a much longer occasional run shown in its time-tables, as on Fridays and Saturdays only during the season there is a 12.25 p.m. express from Whitchurch scheduled to cover the 75 miles thence to Machynlleth without intermediate stoppage in 2¼ hours. At the moment of writing I have not been able to ascertain whether this journey is actually non-stop, or includes any halt for working purposes only.

year; the fastest run on the latter which any *passenger* is able to make is on the Westbury slip coach of the 4 p.m. down—95.6 miles in 103 min., equals 55.7 m.p.h. average. The North Eastern Railway by its further acceleration of the 5.30 p.m. from King's Cross, ties with the Great Western in the matter of speed. There is no "counsel of perfection" in the Great Northern of Ireland snippet, as the course is steeply down hill throughout, and the Midland run is equally easy of accomplishment. Acceleration of the 5 p.m. *ex*-King's Cross between Hitchin and Huntingdon brings this run within

TABLE C.—LONGEST NON-STOP RUNS IN AUGUST, 1920, ON RAILWAYS HAVING NO RUNS EXCEEDING 100 MILES.

Railway.	Runs between	Distance.	No. of Runs.	Fastest Time.	Speed.	Fastest Train.	Longest run in Aug., 1914.
		Miles.		Min.	m.p.h		Miles.
G. & S.W.R. ...	Kilmarnock–Carlisle ...	91.1	1	125	43.7	(*a*) 11.10 p.m.U	91.1
L. & S.W.R. ...	Salisbury–Exeter ...	88.0	3	117	45.1	(*b*) 11.53 a.m.D	108.0
G.S. & W.R. (I) ...	Dublin–Thurles ...	86.8	1	110	47.3	11.0 a.m., D	86.8
L.B. & S.C.R.	Victoria–Fratton ...	84.4	1	111	45.6	11.35 a.m., D	84.4
S.E. & C.R. ...	Victoria-Dover Marine (*c*)	78.0	1(*d*)	115	40.1	11.0 a.m., D	78.0
N.B.R.	Arbroath–Edinburgh	76.3	1	114	40.2	7.59 p.m., U	98.2
L. & Y.R. ...	Halifax–Waterloo Road (*e*)	60.7	1(*f*)	103	35.4	8.19 a.m., D	60.7
G.N.R. (I) ...	Dublin–Dundalk ...	54.3	1	64	50.9	3.0 p.m., D	33.3
M.G.W.R. (I) ...	Dublin–Mullingar ...	50.0	7	70	42.9	4.55 p.m., U	50.0
Cambrian R. ...	Dovey Junct.–Welshpool	45.0	1	83	32.5	12.40 p.m., U	34.0
Highland R. ...	Perth–Blair Atholl ...	35.3	5	50	42.3	6.25 p.m., U	68.8

(*a*) 6.27 a.m. D in 121 min., but includes 5 min. stop at Dumfries.
(*b*) Also 12.33 p.m. down in same time.
(*c*) *via* Chatham.
(*d*) Also many conditional up boat timings by same route.
(*e*) *via* Todmorden, Accrington, Blackburn, Lostock Hall, Preston, Kirkham and New Line.
(*f*) Saturdays only.

Table D is, as always, one of considerable interest, and it is worth noting that the average of the speeds of the 20 runs shown as representing 1920 is only 2.5 m.p.h. below that of 1914, *e.g.*, 51.3 m.p.h. as against 53.8 m.p.h. The Great Central Railway is displaced from the premier position of last year by the Caledonian Company, who—all honour to them—have reinstated in their time-tables the actual run which figured as their best in 1914. It is made on the up "Postal," leaving Aberdeen at 3 p.m. On the Great Central and Great Western lines the fastest runs are unaltered from last

1 min. of its pre-war time, and raises the Great Northern Railway "best" to 54 m.p.h. On the Great Eastern Railway there is strictly a faster run than that shown, as the 2.55 p.m. from Billericay to Wickford on the Southend branch is still shown to run this 4.6 miles in 5 min., start-to-stop, at an average of 55.2 m.p.h. This practically impossible feat is one of the last survivals of the "radical alterations" time-table of October, 1914; for it I have substituted the best practical booking, and a very smart one at that, in view of the intermediate grades. The South Eastern and Chatham run is the

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same as last year, but the London and North Western, on the 4.50 p.m. from Birmingham, is faster than last year's run; on the Cheshire Lines' Committee's system the palm is now taken by a Midland-operated train. Elsewhere in the table there is practically no alteration from last year, except that the practically impossible run of the Great Southern and Western Railway of Ireland is replaced by one which can be kept and improved on without difficulty, as witness the fact that I have made the 30-mile run in question in 34 min.

as it did in pre-war days, the North Western coming second, and the Midland third. The Pullman services of the Caledonian and Brighton Railways also give these companies high places in the table, the former being far ahead of its pre-war total, as the Caledonian "Pullmans" had not materialised in the summer of 1914. One of the most creditable figures of all is the Great Eastern total of 36 services, entirely self-operated, and one in advance of the pre-war total; it is certainly surprising to see the Great Eastern Railway so much in advance of

TABLE D.—FASTEST RUNS ON LEADING RAILWAYS IN 1914 AND 1920.

Railway.	In August, 1920						¶In 1914. Speed. m.p.h.
	Train.	From	To	Miles	Minutes	Speed m.p.h.	
Caledonian R	4.20 p.m.	Forfar ...	Perth ...	32.5	34	57.4	57.4
G.C.R. ...	4.13 a.m.	Rugby	Leicester ...	19.9	21	56.9	61.3
G.W.R. ...	(a)2.30 a.m.	Paddington ...	Swindon ...	77.3	83	55.9	59.2
N.E.R. ...	9.22 p.m.	Clifton Junct.(b)	Darlington ...	43.8	47	55.9	61.7
G.N.R. (I) ...	9.4 a.m.	Adavoyle ...	Dundalk ...	8.3	9	55.0	50.0
Midland R....	12.31 p.m.	Appleby ...	Carlisle ...	30.8	34	54.4	56.8
G.N.R. ...	5.53 p.m.	Hitchin ...	Huntingdon	27.0	30	54.0	57.5
G.E.R. ...	5.57 a.m.	Shenfield ...	Rochford ...	18.5	21	52.9	52.9
S.E. & C.R.	12.10 p.m.	Faversham ...	Margate ...	21.9	25	52.6	54.8
L. & N.W.R.	6.1 p.m.	Blisworth ...	Willesden ...	57.5	66	52.3	57.7
C.L.C. ...	(f) 5.34 p.m.	Cheadle Heath	Liverpool ...	36.4	43	50.8	51.7
L.& S.W.R.	9.21 a.m.	Dorchester ...	Wareham ...	15.0	18	50.0	57.2
G. & S.W.R.	5.10 p.m.	Glasgow ...	Ayr	41.4	50	49.7	54.6
L.B. & S.C.R.	5.50 p.m.	Horsham ...	Arundel ...	20.6	25	49.4	51.0
L. & Y.R. ...	(d)21 trains	Liverpool ...	Manchester ...	36.5	45	48.7	54.7
G.S. & W.R.(I)	7.53 p.m.	Kildare ...	Dublin ...	30.0	37	48.6	51.9
N.B.R. ...	7.14 p.m.	Linlithgow ...	Edinburgh (W)	17.6	22	48.0	52.3
G.N.S.R. ...	8.45 a.m.	Ballater... ...	Aboyne ...	11.0	14	47.1	47.1
N.S.R. ...	12.49 p.m.	Macclesfield ...	Stoke ...	19.8	27	44.0	44.0
Highland R....	6.25 p.m.	Blair Atholl ...	Perth ...	35.3	50	42.3	41.5

(a) Newspaper Express; passengers not conveyed. (b) North end of York Station.
(d) In both directions. (f) Worked by Midland Co.
¶ Not necessarily between the same stations.

Lastly we come to Table E, which shows by far the most substantial post-war improvement of all. In the aggregate there is an increase of 41 per cent. over the number of restaurant car trains operating last year. On the Great Western Railway the increase is no less than 150 per cent., on the Great Eastern Railway it is 57 per cent., on the North British Railway 50 per cent., on the Midland 38 per cent., and on the London and North Western 39 per cent. With such an increase the Great Western Railway, needless to say, takes the premier place, such companies as the Great Northern and the North Eastern. The latter, indeed, is in a somewhat backward stage of post-war long-distance travel improvement, such a train as the 8.55 a.m. from Leeds to Edinburgh, with a non-stop run of 80½ miles from York to Newcastle, and 124½ miles thence to Edinburgh, being still composed of non-corridor stock. The "foreign" working in Table E is generally a matter of interest, and is made up as follows:—Seven services on the Great Western Railway comprise the London and South Western cars in each

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direction between Bournemouth and Birkenhead, the Midland Bradford cars to and from Taunton, and one direction each of the two Liverpool-Plymouth and the Newcastle-Swansea services, worked by the London and North Western and Great Central companies respectively. The North Western "foreigners" are the other directions of the Plymouth-Liverpool services, operated by the Great Western Railway. On the North Eastern between Preston and Liverpool (Exchange) and the Midland Manchester (Victoria) to St. Pancras train, with its return working, total 10. Only one "foreign" restaurant train appears on the Great Central Railway each day, this being the one-way only Great Western Railway working of the Newcastle-Swansea service. On the Cambrian Railway the Paddington-Aberystwith service of the Great Western Railway figures (the first fully-fledged

TABLE E.—RESTAURANT AND PULLMAN CAR TRAINS IN 1914, 1918, AND 1920.

Railway.	Restaurant Cars.			Tea cars.	Pullman cars.	Totals.		
	Worked	Jointly Worked.	Worked by Foreign Cos.			Aug., 1920.	Oct., 1918.	July, 1914.
G.W.R.	51	—	7	2	—	60	—	88
L. & N.W.R. ...	34	11	2	6	—	53	—	80
Midland R. ...	38	6	—	—	—	44	20	64
Caledonian R. ...	13*	12	—	—	16	41	—	23
L.B. & S.C.R. ...	—	—	—	—	40	40	20	44
G.E.R.	36	—	—	—	—	36	4	35
L. & S.W.R. ...	30	—	—	—	—	30	12	36
N.B.R.	16	8	—	—	—	24	—	40
G.N.R.	13	10	—	—	—	23	—	34
N.E.R.	4	10	8	—	—	20	—	42
S.E. & C.R. ...	—	—	—	—	20	20	—	17
L. & Y.R.	6	—	10	—	—	16	2	22
G.C.R.	11	—	1	—	—	12	8	22
G.N.R. (I)	6	—	—	6	—	12	8	4
G. & S.W.R. ...	4	4	—	—	—	8	2	10
Metropolitan R. ...	—	—	—	—	8	8	—	10
G.S. & W.R. ...	6	—	—	—	—	6	—	6
D. & S.E.R. ...	2	—	2	—	—	4	—	4
Cambrian R. ...	—	—	2	2	—	4	—	—
M.G.W.R.	2	—	—	—	—	2	—	2
N.C.C. (I)	—	—	—	—	—	—	—	2
† Net Totals ...	272	28	—	16	84	400	72	474

* 1st and 3rd class restaurant cars operated by Pullman Co.

† These figures do not include the same cars more than once when they run over more than one system.

Railway the total of 8 is made up by two Newcastle-Swansea trains (one Great Western and one Great Central), two Liverpool-Newcastle through expresses (Lancashire and Yorkshire), and the Great Northern services between London and Hull and Harrogate, one in each direction daily in each case. The Lancashire and Yorkshire Railway has, north of Penistone, the two Great Central expresses each way daily between London and Bradford, the two West Coast services restaurant car in history on the Cambrian system), in addition to the Cambrian Railways' own buffet car service of last year, reinstated this summer, between Whitchurch and Aberystwith; the "foreign" working on the Dublin and South Eastern Railway is the through service to and from Kingstown of the Great Southern and Western Cork express. It may be mentioned that "tea-cars" in this table are confined to those trains in which a small kitchen is provided in

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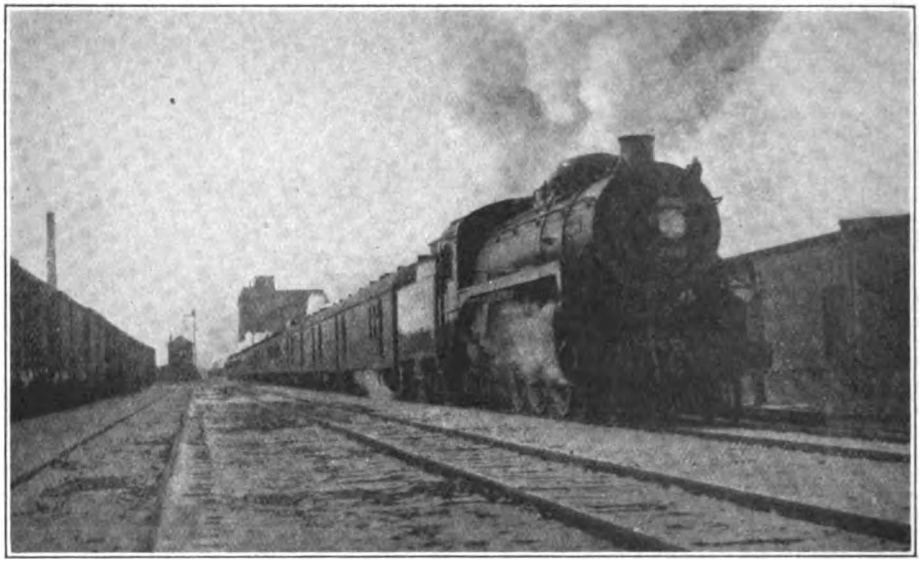
an ordinary compartment coach for the purpose of serving teas and light refreshments only; in cases where an ordinary restaurant car is employed as a tea-car, it is included among the restaurant cars.

It should be emphasized, in conclusion, that all the times figuring in the foregoing tables have been culled from the various companies' *working* time-tables, and not from the public books; I mention this in order to save readers the trouble of writing to point out apparent errors in the figures when the working and public times are not in exact agreement.

A FAMOUS CANADIAN PACIFIC RAILWAY TRAIN.

TORONTO EXPRESS NO. 4 LEAVING CALGARY.



WE are indebted to Mr. C. J. R. Littlebury, of Calgary, for the photograph above reproduced showing train No. 4, the East-bound "Toronto Express," leaving Calgary. The locomotive is No. 2707, one of the new 4-6-2's built this year at the Angus shops, Montreal. Steam pressure is 200 lb. per sq. in., cylinders 24½ in. by 30 in., coupled wheels, 5 ft. 10 in. diameter, total heating surface 4,734 sq. ft., weight of engine in working order 133½ tons, weight of engine and tender, 213 tons.

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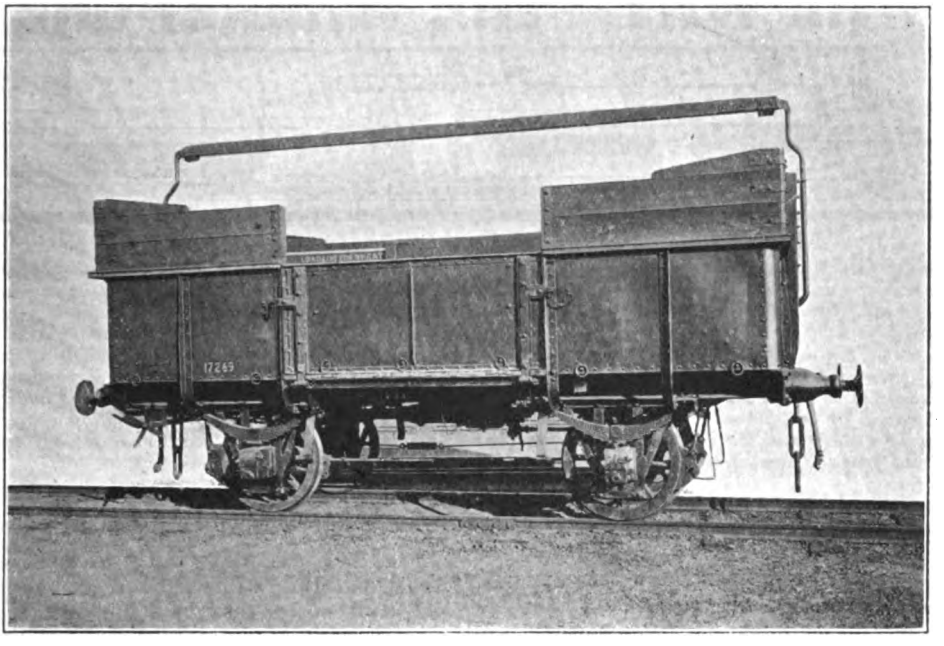
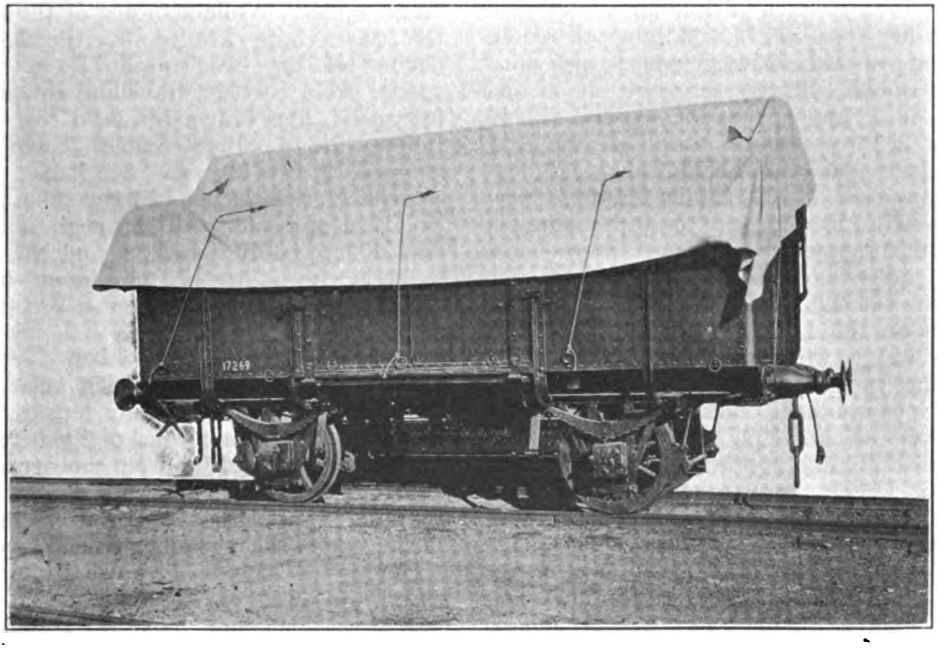
INCREASING CAPACITY OF FOUR-WHEELED OPEN WAGONS.



BEFORE SHEETING, SHOWING RAISED ENDS AND SIDES.



SHEETED FOR TRANSIT.

In order to meet the demands of wheat traffic on the New South Wales Government Railways, a number of steel four-wheeled wagons have been fitted with side and end pieces, as shown above, in order to provide increased capacity by enabling wheat in bulk to be heaped to greater efficiency, with less waste of space towards the ends, and to prevent wheat being thrown over the ends during shunting and by running shocks.

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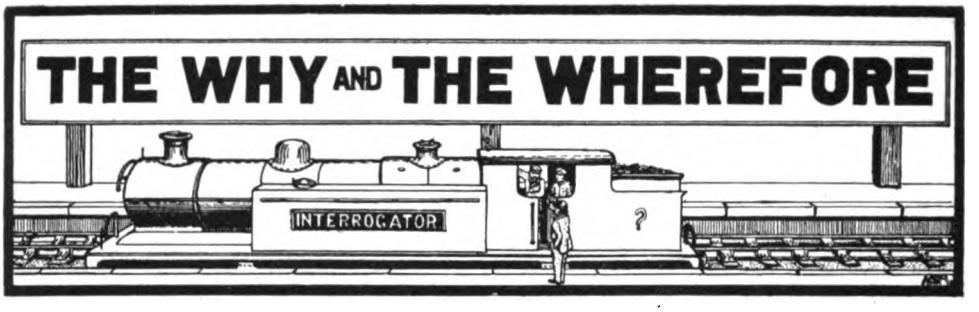

RAILWAY MAGAZINE readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o RAILWAY MAGAZINE, 30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book," for the current year. Price 5s. By post 5s. 9d.

Locomotive Horse-Power.

Indicated horse-power, which is the customary method of measuring the tractive power actually developed by a locomotive, is found by the formula i.h.p. (indicated horse power) $= \frac{2\,anpl.}{33{,}000}$, where a = area of each piston (of a 2-cylinder engine) in sq. in; n = number of revolutions of the driving wheels per min.; p = mean effective pressure in lb. per sq. in.; and l = length of stroke in in. For a three-cylinder simple engine "3" replaces "2" in the formula, and "4" in the case of a 4-cylinder simple. Mean effective pressure can only be obtained accurately by measurement from indicator diagrams taken direct from the cylinders while the engine is in motion; during the run on the London and North Western Railway to which you refer the engine was being indicated, and it was from the various indicator diagrams taken that the details of horse-power were calculated. Resistance due to gravity alone in running up inclines is simply calculated by dividing the total weight of the train (engine included), reduced to pounds, by the figure representing the grade, *e.g.*, 200 in the case of a 1 in 200 grade. Odd dimensions of different engines are not of general interest, and are therefore excluded by the rules; your second query comes in this category. [Reply to "WATT."]

Quintinshill Accident, Caledonian Railway.

On May 22, 1915, the 6.10 a.m. down stopping train from Carlisle was shunted on to the up road at Quintinshill Box (between Gretna and Kirkpatrick) in order to allow the midnight express from Euston to Glasgow, which was running late, to pass. While standing at the box, the slow train, headed by the 4–6–0 engine No. 907, was run into by a troop special from Larbert, travelling almost at full speed, and drawn by 4-4-0 No. 121. Before the London express could be stopped, it ran into the wreckage; the engines on the latter train were 4-4-0's Nos. 140 and 148. All the engines concerned were badly damaged, and No. 907 so seriously as to be withdrawn from service. (Reply to WILLIAM WILSON.)

Superheater Locomotives.

This query has already been answered more than once, and we may repeat that there is no certain means of identifying superheater locomotives from their general appearance. Frequently, however, they are differentiated by the damper cylinder on the side of the smokebox (if employed), by the relief valves now usually fitted behind the chimney, but sometimes at the base of the smokebox above the cylinders, or by the provision of a mechanical lubricator. None of these is, however, entirely conclusive, and as a rule it is necessary to

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consider each engine on its merits or to depend upon knowledge.

[Reply to A. W. PUTTICK.]

Chimney Capuchons.

In further reply to this query, published in the July RAILWAY MAGAZINE, Mr. G. Cecil Poultney gives another explanation. He states that the capuchon is provided to facilitate the emission of smoke when the engine is running with the regulator closed, and to prevent a down-draught, which is especially dangerous if the fire doors happen to be open when the engine is running with the regulator shut. The capuchon, under these conditions, deflects the air current flowing across the top of the chimney, and thus allows the gases more readily to escape.

[Further reply to A.F.F.]

The "Flying Dutchman."

The "Flying Dutchman" used to leave Paddington, Great Western Railway, at 11.45 a.m. for Penzance, and was at one time the most important train to the West of England; but faster trains at other hours of the day, and the opening of the short route *via* Westbury, have caused the "Dutchman" in course of time to lose its distinction. Before the war there was still an express leaving Paddington for Bristol at 11.45 a.m., but this has now vanished, and the title is therefore extinct.

[Reply to "P.M."]

"Dead-Man's Handle."

This appliance, usual on all electric lines concerned with intense traffic, includes a spherical head or button fitted into the controller handle so that while the motorman has his hand upon it the head or button is pressed down. Otherwise current is cut-off and the brakes applied, thus ensuring stoppage of a train should the motorman be taken ill or other eventuality arise. Its introduction was made a condition before the old rule as to two men in the driving compartment was allowed to be abrogated.

[Reply to W. W. STEWART.]

G.W.R. 4-4-0 Engines.

The numerical classification carried out some years ago brought engines of similar classes together, but it does not follow that all the engines concerned have been made to correspond in every way. As far as we know, Nos. 4169 and 4170 still retain the leading dimensions of old Nos. 7 and 8, with 7 ft. coupled wheels, except in so far as the boiler and other parts affected by rebuilding and maintenance have been changed.

[Reply to E. E. LITTLE.]

Kent and East Sussex Railway Locomotives.

We are indebted to Lieut.-Col. H. F. Stephens for details of the locomotive stock of this railway. It comprises two 0-6-0 tender engines with 16 in. cylinders; two 16 in. 0-6-0 well tank engines; one 14 in. 0-6-0 saddle tank; one 16 in. 0-8-0 side tank; and two 12 in. 2-4-0 side tanks—total, 8 locomotives, together with a steam rail car, fitted with a 7 in. marine type engine. The line was opened March, 1900. [Reply to S. DIESCH.]

Power-Operated Signals.

At Victoria, London, Brighton and South Coast Railway, signals are operated electrically, and in the adjoining South Eastern and Chatham Railway station all points and signals are now worked by power as described recently in the RAILWAY MAGAZINE. At Folkestone Harbour, power signals are also employed, and on both lines "banner" signals are used here and there. [Reply to H. A. ROPER.]

Tractive Power of Locomotives.

As the tractive power formula takes account only of cylinder and coupled wheel dimensions and of boiler pressure, it may give anomalous results when used by itself. In practice boiler capacity and other factors apply, so that the results given by a formula have to be interpreted in conjunction with these and other practical considerations.

[Reply to "HAMPTONIAN."]

Headlights: Metropolitan District Railway.

No trains terminate regularly at the station you mention, and we are not aware that any which may do so for stabling purposes are given special codes. The District trains do not run to Addison Road, that service being worked by London and North Western Railway electric trains running between Willesden Junction and Earl's Court.

[Reply to E. C. B. THORNTON.]

Condensing Locomotives, Great Western Railway.

Presumably you refer to tank engines fitted with condensing equipment. When working on underground lines these loco-

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motives turn the exhaust steam into the water tanks, but as the water becomes hot not all of it is condensed and the remainder escapes through the side chimneys you have noted. [Reply to A. S. M.]

Tractive Effort of Midland Locomotives.

Nominal tractive effort, at 80 per cent. working pressure, of the types mentioned by you is as follows:—"999" class 4-4-0, 19,250 lb.; "3835" class 0-6-0, 21,130 lb.; compound 4-4-0, 24,630 lb. when working as 2-cylinder simple at the moment of starting, and 12,630 lb. (by the Baldwin formula) when working full compound. [Reply to "DERBY."]

Record Runs on the Midland Railway.

We know of no faster record between Ais Gill and Carlisle than that made by the 4-4-0 engine No. 2607 (old numbering) in running from the summit to Carlisle, start to stop, in 41 min. 55 sec., as described in detail by Mr. Cecil J. Allen in his "British Locomotive Practice and Performance" article of September, 1913.

[Reply to R. T. ELLIS.]

Midland & South Western Junction Railway.

Tender engines on this line are: 10 (4-4-0), 10 (0-6-0), 1 (2-6-0-), and 3 (2-4-0). Tank engines: 2 (4-4-4), 2 (0-6-0-), 1 (0-4-4) Information of this kind is given very fully in the RAILWAY YEAR-BOOK. We do not undertake to give details individually, please see rules.

[Reply to A. H. ELTON.]

Voltage, L.B. & S.C.R. Electric Lines.

Mr. R. H. Houghton, electrical engineer, London, Brighton and South Coast Railway, states that the voltage used on the electric sections of the Brighton line is 6600, and that there has been no change in this respect.

[Further reply to "JUICE" and H. J. C. PALFREY.]

Watford Electric Services.

New trains expressly built for this service, described in the May RAILWAY MAGAZINE, are joint between the London and North Western and London Electric Railways. London and North Western Railway electric trains also work on the same route to and from Broad Street.

[Reply to "ALDENHAMIAN."]

Locomotive Queries.

Attention may be directed to the rules at the head of this section as to locomotive queries. We do not undertake to answer queries as to passing phases, as for example the number of engines in service, to date, of a class which is constantly being added to.

[Reply to A. H. G. CRASKE.]

London, Chatham and Dover Railway and Hastings.

London, Chatham and Dover Railway trains did not run to Hastings prior to amalgamation, but at an early date following the formation of the Working Committee, trains from Victoria to Hastings were instituted.

[Reply to "ENQUIRER."]

South Eastern and Chatham Railway Locomotives.

Prior to amalgamation London, Chatham and Dover Railway locomotives were painted black, while the South Eastern Railway engines were dark green, very similar to the colour in use for joint locomotives before the war.

[Reply to "ENQUIRER."]

A Midland Locomotive Query.

Mr. G. Cecil Poultney suggests that the apparatus referred to is the large ejector for working the vacuum brake. This on Midland engines is placed on the right hand side of the boiler barrel within a few feet of the smokebox.

[Further reply to W. S. UPTON.]

The Fastest British Express.

At present the fastest start-to-stop run in the British Isles is performed by the 4.20 p.m. express from Forfar to Perth, Caledonian Railway, covering the 32½ miles in 34 min., at an average speed of 57.4 m.p.h.

[Reply to A. AXSON.]

4-4-2. No. 990, Great Northern Railway.

This engine, the pioneer Great Northern "Atlantic," is still running, and was recently stationed at Peterborough, taking turns on ordinary express duties. We have since noted it at Cambridge, presumably as a London engine.

[Reply to "ATLANTIC."]

Signalling, Ealing and Shepherd's Bush Railway.

Signals with pointed ends accord with American practice, where this indicates that they operate automatically. With square ends the signals are under the control of a power signal cabin.

[Reply to E. C. B. THORNTON.]

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"Sir Sam Fay" Class 4-6-0's Great Central Railway.

Mr. C. B. Firth writes that Nos. 423 *Sir Sam Fay*, 425 *City of Manchester*, and 428 *City of Liverpool*, are painted in passenger service colours, the others being black.

[Further reply to F. R. ALEXANDER.]

Caledonian Locomotives.

No. 62, of the "60" class, 4-6-0, designed by Mr. Pickersgill, was illustrated and described in the RAILWAY MAGAZINE, April, 1917. 4-6-2 tank engine No. 945 was illustrated in August, 1917.

[Reply to A. W. ANDERSON.]

Pre-War G.W.R. Train Speeds.

Fastest times from London (Paddington) before the war to the stations mentioned were: Oxford, 70 min.; Swindon, 84 min. (an up train); Bath, 108 min. (by slip carriage), and Bristol, 120 min.

[Reply to D. GODBER.]

9.45 p.m. Parcel Train, Leeds to Euston.

Calls at Batley, Dewsbury, Huddersfield, Stalybridge, Stockport, Crewe, Nuneaton, Rugby, Northampton, Bletchley, Watford and Willesden, and reaches Euston at 7 a.m.

(Reply to WILLIAM WILSON.]

Runaway Switches.

By Board of Trade regulations, runaway switches are compulsory on grades of 1 in 260 and steeper, "when danger is apprehended from vehicles running back."

[Reply to T.T.]

Locomotive Power Classification, Somerset & Dorset Railway.

We understand that the letters 4P, 2G indicate power classification respectively for passenger and goods service.

[Reply to "SINGLE-WHEELER."]

American Cars, South Eastern and Chatham Railway.

These cars have been purchased by the Pullman Car Company and rebuilt as Pullman Cars. [Reply to F. H. LEE.]

London and South Western Railway Sleeping Cars.

There are now no sleeping cars in use on the London and South Western Railway. [Reply to "DEVONIAN."]

4-6-0 Locomotives, G. & S.W.R.

No. 4–6–0 engines run on this line other than those designed by Mr. James Manson. We cannot predict future developments. [Reply to HENRY FORD.]

Numbers of Locomotives.

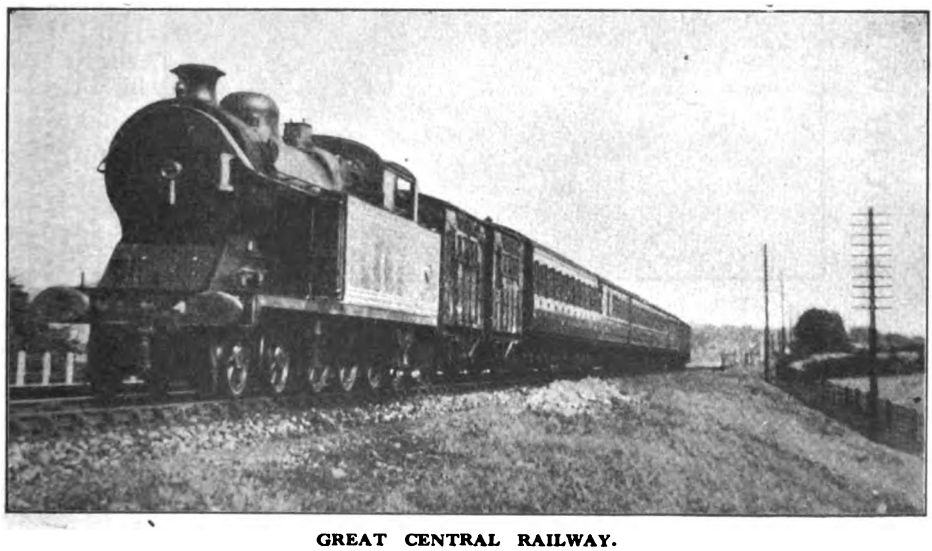
We do not undertake to give numbers of engines in a given class. Please see rules.

[Reply to H. D. and others.]

4-4-0 Engines, "863" class, Midland Railway.

Information desired is of a class we do not provide. See rules.

[Reply to "TRAFFORD PARK."]



GREAT CENTRAL RAILWAY.

Marylebone–Aylesbury train near Harrow. 4-6-2 tank locomotive, No. 452.

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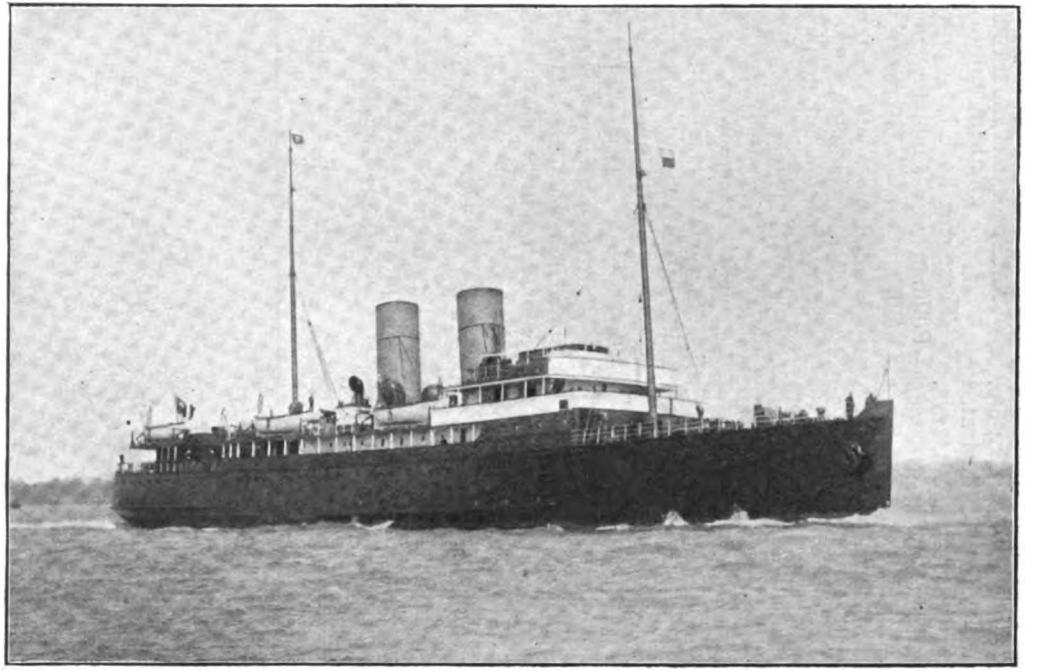
LONDON & SOUTH WESTERN RAILWAY NEW CROSS-CHANNEL STEAMER.



THE "LORINA" IN SOUTHAMPTON WATER.

AN exceptionally fine ship! Such is the verdict of all who have viewed the London and South Western Railway's newest cross-channel steamer. Fitted with Parsons' geared turbines, her average speed is 20 knots per hour. Her tonnage is 1,503 tons gross and 605 tons net, and she was built by Denny Bros., Dumbarton, in 1918. First employed by the British Government as a troopship, she was reconditioned at Dundee and then returned to Southampton.

The interior accommodation of the *Lorina* surpasses anything hitherto attempted on any of the London and South Western Railway's steamers. Instead of the old-fashioned type of dining saloon with table down the centre, the saloon has two tables, each seating 20 people, and the remainder of the room is taken by tables for four, as in a restaurant. All the appointments are very up-to-date, especially in the cabin accommodation, where she is exactly like a transatlantic liner in miniature.

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PERTINENT PARAGRAPHS

Locomotive Engine as a War Memorial.

Under this heading a photograph was reproduced last month showing London and North Western Railway locomotive No. 1914, *Patriot*, and as the frontispiece to this issue another view is given of the same engine on the 1.15 p.m. Anglo-Scottish express at Euston. It will be recalled that in addition to its name the engine bears the following inscription: "IN MEMORY OF THE FALLEN LONDON AND NORTH WESTERN RAILWAY EMPLOYEES, 1914–1919." Besides those mentioned there are several other items of interest concerning this engine. It is japanned a dull jet black in token of mourning, including the background of the number plate, which is usually red, while the absence of a crest or other decoration adds to the sombre effect. The black is set off and intensified by touches of brass and steel. The wash-out caps are painted black, and the safety-valve columns are of unpainted brass. In general No. 1914 corresponds with the "Claughton" class as a whole, except that it includes minor improvements incorporated in the design as further engines have been built. "Pop" safety valves are employed for this engine.

The New Railway Charges.

UNTIL the Rates Advisory Committee of the Ministry of Transport had issued their interim report it was almost inevitable that press indications of probable increases in railway charges, given in anticipation, should create a somewhat "stressful atmosphere"; but the fact that the recommendations eventually made proposed an advance of only one farthing a mile in passenger fares, instead of the expected half-penny, somewhat smoothed over the natural antagonism aroused by the threatened imposition of the higher charges right in the middle of the usual holiday period. That these increases have to be made is now recognised in all reasonable quarters, and when reduced to about three shillings in the pound instead of six shillings or so, they become more practicable, even for people to whom the increase upon several fares, as involved by the usual family party, realises in the aggregate a substantial amount As it is, railway fares are now only increased by 75 per cent. upon pre-war rates, whereas wages and material costs represent about 200 per cent. above the old figures. Against this has to be set the fact that all railway travel has hitherto been at the existing ordinary rates, whereas in the old days a good proportion was at tourist, week-end and excursion fares; but once the railways are placed upon a proper footing, to conduct their own business in their own way, many of these facilities will undoubtedly be restored at proportionate, though not, of course, the old charges.

The increases upon season-tickets will press hardly upon many people; especially those who have been induced in the past by the good facilities and reasonable charges offered by the railways to live a fair distance out. But here again the severity of the increase is lessened somewhat by the present limitation to 50 per cent. upon pre-war rates, bearing in mind that these tickets are already subject to 10 or 20 per cent. according to distance. New charges for workmen, by "early cheap trains" to become operative on September 1st, will remove one of the anomalies of the situation, in that those for whom the old exceptionally cheap workmen's fares were instituted are now the people who, on the average, have received most additions to wages against the higher cost of living. Even at the new rates these facilities will still be very reasonable. On the whole, the increased railway charges must be regarded as inevitable in view of the problem to be faced, and that, with the promise of special facilities in the near future, they have been imposed on a reasonable basis. It remains to be seen, however, how far the increases in goods rates and charges will act to raise still further the "cost of living," and so start once more the vicious circle of higher wage demands.

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The Excursion Train Problem.

Advisedly and necessarily excursion and other cheap fare facilities were discontinued during the war period, but the question as to restoration of all or some of them is now becoming a very live one. Obviously the old rates cannot be expected once more, but even at double or even a larger ratio of pre-war charges there is much to be said in favour of their reintroduction. In fact, it will be generally admitted that future railway working must provide for them, for only on this basis can new traffic of a holiday character be attracted, and with ordinary fares raised to so high a level as is now contemplated, their absence must continue to restrict railway travel as regards people of limited means to the shorter journeys or to infrequent occasions.

At the time of writing a start has been made and several railways have already commenced to run day excursion trips. The Lancashire and Yorkshire, London, Brighton and South Coast, and South Eastern and Chatham Railways were first in regard to announcements, but the Great Eastern Railway has the distinction of inaugurating the new excursion era, with day-trips on Thursday, Aug. 12, to Southend-on-Sea, Clacton-on-Sea, Walton-on-Naze and Frinton-on-Sea. In all cases the present single third-class fare is charged for return the same day, no luggage is allowed, and journeys must be made by the specified trains. Other railways followed, and though, for the time being, certain lines profess their inability to do the same it is anticipated that the day-trip train will very soon become a standard feature. Period excursions raise a much bigger question, but once the start has been made the way is clear for further developments.

Apart from day excursions, and for the time being, it must be accepted that insistence upon full "actual fares" is a necessity, and there can be little doubt that any concessions in this direction would involve reduced revenue. Many people who would otherwise pay the present rates would take advantage, as well as those for whose benefit such concessions are justified. We have first to settle down to new standards of rates and charges, in the same way as new standards of living costs have had to be accepted. But when the transition period is over, and the sooner the new conditions are removed from the realm of uncertainty the better from this point of view, then it will be practicable to give full consideration to the re-cultivation of the "travel habit" and to the provision of facilities designed to attract traffic which otherwise would not exist.

It is this aspect which is least understood generally, that excursion and other cheap facilities have always been designed as means for attracting and creating traffic: as yet this factor does not apply, but as the "new world" becomes stabilised, such methods will, no doubt, figure prominently, though perhaps not on so liberal a scale as in pre-war days. For the present travel must remain a necessity or a luxury, according to individual conditions, but we anticipate that when once the difficult transition period now existing is traversed, we may look for generous provision of reasonable facilities on the part of our railway companies.

International Association of Railway Correspondents.

This Society has been formed with headquarters in Sydney, N.S.W., where Mr. C. F. Dewey, whose address is 45, Pine Street, with the assistance of Mr. W. Stewart, of 44, Eden Vale Road, Mount Eden, Auckland, New Zealand, are serving jointly in a secretarial capacity. It has been established for the mutual interchange of railway and locomotive information, photographs, railway periodicals, &c., and the promotion of general interest in railway matters. Branches are being established in other parts of Australia and New Zealand, also in the United States, Canada, France and Italy, with associations with railway enthusiasts in the United Kingdom.

We have on several occasions referred to correspondence and reproduced photographs forwarded by both Mr. Dewey and Mr. Stewart, and if only because of the very real railway interest they have displayed, and the fact that the formation of this association indicates that the study of railway working in all branches is as much a live matter in other parts of our great Empire as it is here, we invite readers to take up with either of these gentlemen. As no subscription is entailed, and the idea is that of mutual helpfulness, we would suggest that, at any rate until personal relations may have been established between any two members, it be required that stamps to cover reply should be insisted upon, otherwise Messrs. Dewey and Stewart may find that a large body of correspondents entails considerable demands upon purse as well as time. But when properly established on an exchange basis the association should be of distinct value in bringing together those of kindred interests. In other words, what the Railway Club has done and is doing in the United Kingdom is extended on an imperial and international basis.

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Railway Working in Australia.

Accompanying the letter upon which the foregoing paragraph is based, Mr. Dewey sends several photographs, one of which is reproduced herewith showing No. 84 Up North Passenger Train, New South Wales Government Railways, approaching Beecroft, amidst typical Australian scenery. It is drawn by a "P" class 4-6-0 locomotive. He also writes as follows:—

"Great interest is being displayed here in connection with the manufacture at the Eveleigh (Sydney) workshops of the New South Wales Railways, of a number of steel tools and mechanical parts which have hitherto been imported. During the war, you will understand, we were left to our own resources a great deal, supplies of steel, steel tyres, and many other railway wares being unobtainable from abroad; but I believe that we Australians can do anything if we but try (the only thing is that we are perhaps a little bit lethargic), consequently, after some perseverance, we are now able to turn out locomotive tyres equal to, if not better, than the imported article. Hydraulic lifting jacks, steel gear-cutting tools, screw taps and dies are among other articles of note that have been turned out at these shops."

Photo.] NEW SOUTH WALES GOVERNMENT RAILWAYS. [*C. F. Dewey.*

Up North Passenger Train approaching Beecroft.

Railway Timetables.

Commenting upon remarks and suggestions in regard to railway timetables, published in the July RAILWAY MAGAZINE, Mr. S. Greenhill writes in reference to certain other points, though some of them apply more particularly to "Bradshaw." He suggests that all references to restaurant car and sleeping-car facilities should be transferred to the notes, or covered by a conventional sign or index letter. Or they might be set forth separately in a special section. He also directs attention to the anomaly of including references to restaurant cars in certain tables, but which apply only to other tables. For example, he specifies "Dining Car, London to Bristol" in the Taunton-Penzance table, Great Western Railway, and "Restaurant Car, Edinburgh to Aberdeen," in the Carlisle-Edinburgh table, North British Railway. Seeing that these tables are of interest to travellers whose journeys extend beyond the limits of the table concerned, and times at principal stations beyond are usually added to these tables, such indications have a distinct usefulness as they indicate facilities provided on other sections of a journey and thus save the need for looking up every stage in detail. Readers of the RAILWAY MAGAZINE would naturally do this as a matter of interest; but the ordinary user of "Bradshaw" prefers to have all possible information given to him in whatever table may be first consulted. We agree, however, that there is a suggestion of haphazardness about many

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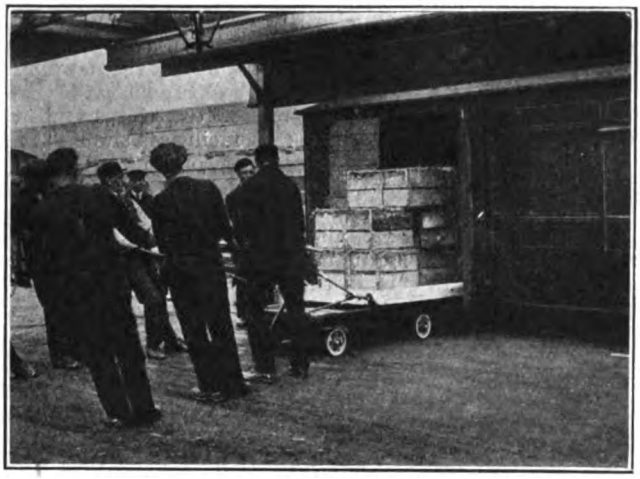

LOADED FLAT BEING DRAWN ON TO TROLLEY, ROSSLARE HARBOUR.

notes of this kind, and either completeness or deletion of supplementary and occasional information of this kind should be aimed at.

It is true that " South Devon and Cornwall Express " conveys only a general indication as to where a train goes, but this description does at least suggest its general destination, and such references have a degree of advertising value. If the train only serves Torquay and Plymouth, it can hardly be described as a Cornwall express, so that the mere fact that Cornwall is included in the title shows that it serves places beyond Plymouth, as well as various Devonshire centres.

We have already suggested that through carriages should be shown as completely as possible, mainly by selected type, or by notes where type indication will not suffice.

Transfer of Perishable Traffic at Rosslare Harbour.

In order to avoid double handling of perishable traffic and to expedite transfer between train and steamer, interesting methods have been adopted by the Great Southern and Western Railway of Ireland in connection with traffic at the Rosslare Harbour, and we are indebted to Mr. H. Purdon, District Traffic Superintendent at Waterford, Great Southern and Western Railway, for particulars thereof, and for the views reproduced.

The volume of perishable traffic arriving at Rosslare Harbour by passenger train has, of late years, been steadily increasing, and as the bulk of this travels from 100 to 125 miles by express trains, which are in many cases scheduled to arrive at Rosslare within a very short period of the departure time of the connecting steamer for England, the Great Southern and Western Railway had a somewhat difficult problem to meet if delays in transhipment were to be avoided. Briefly, the system employed includes the use of false bottoms or flats placed in the parcels vans. These flats are shod with half-round irons adapted to ride on corresponding rails secured to the floor of the van, thereby enabling the flats to be easily slidden laterally through the door of the van and from there on to trolleys which also have corresponding rails. The trolleys are adjusted in height so that their rails shall be on a level with the floor rails in the van, and it is, therefore, quite a simple matter to move the flats from the vans on to the trolleys, even when loaded with from 15 to 20 cwt. of traffic, or to re-transfer the empty flats from trolley to van. Any small variation in the height of the floor of the vans is easily met by tilting slightly the front portion of the trolley, so as to bring the rear to the required level.

Twelve of these flats, measuring 7 ft. by

TRANSFERRING FLAT FROM PARCELS VAN TO TROLLEY, ROSSLARE HARBOUR.

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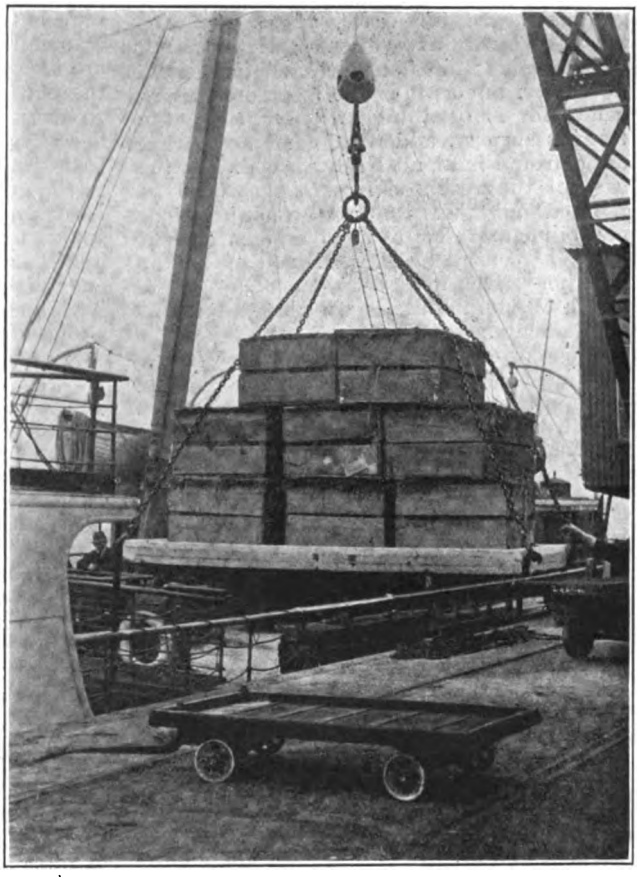
3 ft. 6 in., can be placed in a 50-ft. van. The process of detraining is continuous. As one flat is being taken by trolley from the van to the crane the next flat for transfer is drawn laterally to the door, and by the time another trolley is placed in position it is ready to be drawn upon it. The average time taken for dealing with each flat rarely exceeds one minute. It is found in practice that six men are able to move these flats, even when fully loaded, into any desired position quite easily.

A twofold object has been attained, as in addition to speeding up the transfer, the damage consequent on handling has been considerably reduced; the tallying, sorting and stowing on the flat is performed by the parcels guard in charge of the vans *en route*. Consequently, the consignments are not handled from the time they are so placed by the guard until after arrival at the Welsh port.



TRANSFER OF FLAT FROM TROLLEY TO STEAMER ROSSLARE HARBOUR.

Locomotive Misunderstandings.

A LONG letter has been received from a reader containing criticisms and comments upon the London-Portsmouth train services, and while this is interesting on its own account it suggests that a few remarks upon what we have termed "locomotive misunderstandings" may be in place. For example, certain remarks convey the impression that the superheater tank engines of the London, Brighton and South Coast Railway are small locomotives, because they have tanks instead of tenders. Possibly the conventional method of denoting wheel-types has something to do with this, combined with the idea that a tank engine is necessarily a small machine, and, although it may be used for main line services, that it is still mainly designed for working local traffic. First it may be pointed out that a 4-4-2 tank is *not* an "Atlantic," as that name is understood as suggesting the design of the engine. It is the equivalent of a 4-4-0 tender engine with a pair of trailing wheels to carry the bunker, and except that the weight of the water tanks comes upon the engine itself, many 4-4-2 tank engine designs may be regarded as 4-4-0 tender engine designs adapted in tank engine form. The Brighton 4-4-2 express tank engines are thus equivalent to the 4-4-0 tender engines, just as the Great Western 4-4-2 tank engines are equivalent to the 4-4-0 "County Class" express engines, and within the limits of their coal and water capacity should be able to do the same work and the same speeds. Indeed, in the case of the Brighton engines, we may almost go further and suggest that the superheater 4-4-2 tank engines would also be equivalent in working to the 4-4-2 tender engines, were it not for the fact that the latter are bigger locomotives, and have greater boiler capacity. They have, at any rate, about the same sized coupled wheels, and the differences in cylinder diameters go with the larger boiler. Consequently, there is not so much in the locomotive question as the comments made suggest. It is not a question of power

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capacity so much as the coal and water question, which governs whether a 4-4-0 tender or a 4-4-2 tank engine can be used.

Portsmouth and its Train Services.

As regards the general question of train services we may point out that on both the Brighton and the South Western routes to Portsmouth, there are not only severe gradients, but, in the case of the former, at any rate, many speed restrictions, and these may hamper fast running more than the gradients. In any case, there are good reasons why trains on these services are not timed faster; no doubt the engines could do better, but as it is the locomotive work called for is of a higher order than the timings suggest, and we do not agree that either route is at all badly served. In the case of the Brighton line, it may also be pointed out that the numerous junctions and branch services to be taken into account have a considerable influence upon the schedules given in the various stages The South Western route is very hard in regard to gradients.

Our correspondent mentions the heavy loading which has been realised by the new London and South Western Railway Portsmouth-Plymouth restaurant car trains, showing that they have attracted considerable popular favour. The make-up is: 1 brake third, 1 composite, 1 restaurant car, 1 third, 1 brake third for Plymouth, with a brake first and a brake third for Exeter (Queen Street). The train calls only at Fareham, Netley, St. Denys, Southampton West, Salisbury, Exeter and Okehampton to North Road Plymouth. The new train appeals specially to service men travelling between the great naval centres, Portsmouth and Plymouth.

A "Merchandise Stock Train."

ALTHOUGH a large proportion of our readers are primarily interested in the passenger side of railway working, most of the principal issues of the day are associated with goods traffic, and attention may be directed to an interesting suggestion advanced by a Scottish correspondent. For dealing with small-scale and miscellaneous goods traffic, he proposes the running of what is termed a "merchandise stock train," or a "tranship depôt on wheels." This would consist of 30 to 40-ton wagons, electrically lighted, and with several doors on each side, and probably also with end doors and gangway passages, to enable the train staff of porters and checkers to pass from one vehicle to another while travelling, for stowing and arranging packages collected and for delivery at stations *en route*. Traffic would be stowed at the starting point in station order, the invoices being placed in clips on the side of the van above the packages, and a systematic allocation of train space, based upon the average conditions known to exist along the route served by each train, would enable goods to be placed in the appropriate van and readily identified for delivery. The methods advocated are, in fact, somewhat similar to those adopted for parcels traffic by passenger and special parcels trains, and, in view of the fact that at small stations the goods sheds or stores are frequently situated conveniently to the platforms, it should be a simple matter to work much of this traffic without the necessity for putting off and taking on wagons to be dealt with according to present methods in the goods yard.

Arrangements of this class would also suffice for a considerable proportion of the light-load consignments, and serve the same ends as the systems of "nominated loadings," "composite loads," and other measures now adopted to facilitate light-load traffic.

"Multiple Unit" Express Trains.

THIS title is not employed to preface a disquisition on electrical problems, but it forms an apt introduction to a letter from a reader, who writes to inform us that he has observed an express consisting of eight distinct portions, or "units," and wishes to know if this constitutes a record. The train in question was the 10.50 a.m. from Waterloo, on a date early in July, and the formation, starting from the engine, was two corridor coaches for Plymouth, one for Padstow, one for Bude, a luncheon car for Exeter, three corridor coaches for Ilfracombe, one for Torrington, one for Sidmouth, and a non-corridor four-coach set for Salisbury and stations to Exeter. We should certainly be inclined to think that this was a record formation of its kind, for the total distance covered. Curiously enough, Mr. Cecil J. Allen wrote in his article in a recent issue on the same topic, having noted six different changes in the formation of his train on the 112½ mile journey by the 3 p.m. express from Dublin to Belfast, Great Northern Railway of Ireland. His experience is probably the more noteworthy of the two, as the total distance covered in his case was less than half the London and South Western Railway mileage from Waterloo to Plymouth, and there were other points about the marshalling of his train that rendered it exceptional.

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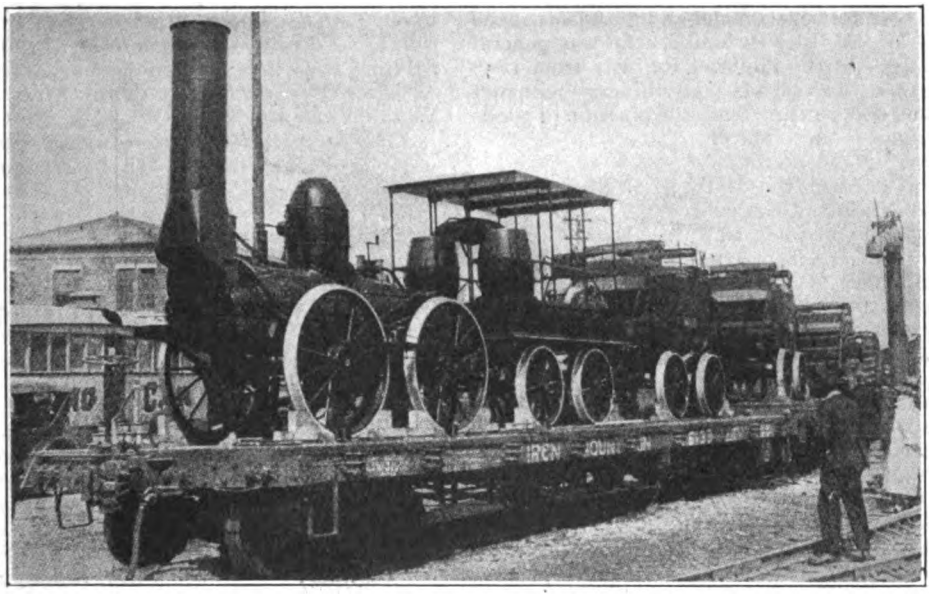
New York's First Railway Train.

FOLLOWING the example set by several British railways the New York Central Railway has placed in the east gallery of their great New York terminal the famous old locomotive *De Witt Clinton* and its train of stage coach cars which ran on New York's first railway. A view is reproduced showing the engine and coaches placed on flat cars for the journey.

This famous old train was photographed as it arrived in New York from near West Albany to be exhibited. The *De Witt Clinton* was constructed at the West Point foundry and made its first trial trip from Albany to Schenectady, August 3rd, 1831, in one hour and forty-five minutes. The first official trip with passengers was made August 9th, 1831, with coal for fuel. Engine defects forced the completion of the trip with horses drawing the cars. After making changes in the engine, coke was unsuccessfully tried. On September 24th, 1831, the first excursion train was run between Albany and Schenectady, wood being used for fuel. The sparks from the yellow pine burned holes in the passengers' clothing and destroyed the umbrellas with which they vainly tried to protect themselves. The return trip with five cars—stage coaches mounted on modified flat cars—was made in 38 minutes, the last six miles being made in the remarkable time of 14 minutes! At times the train attained a speed of 30 miles an hour!



THE "DE WITT CLINTON" AND TRAIN AS CONVEYED TO NEW YORK FOR EXHIBITION AT THE GRAND CENTRAL STATION.

The *De Witt Clinton* without its tender, weighs 9,420 lb.; the tender, 5,340 lb., and each of the coaches, 3,420. This engine is 12 ft. 10 in. long and 8 ft. 5 in. high (to the top of the steam dome). The tender is 10 ft. 11 in. long. The coaches are 14 ft. long.

While mentioning the New York Central terminal at New York, reference may be made to some figures sent us by one of our old readers now in the United States, Mr. Eric Crickmay, in regard to the traffic at this great station. It will be remembered that there are no fewer than 67 tracks in the station, on two levels. The daily totals of trains dealt with, as collated by Mr. Crickmay are:—

	Upper Level.	Lower Level.	Total.
Hudson Electric ..	63	61	124
Harlem Electric ..	20	91	111
N.Y., N.H. and H.R.R.	91	65	156
North Haven Yard Storage	101	—	101
Light engines	24	3	27
Transfers via 57th Street	26	26	52
Total	325	246	571

He suggests that these figures look rather small compared with those associated with Liverpool Street and Waterloo stations in England, but the New York Central Terminal has been built ahead of requirements.

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Mr. G. R. Newcombe, who has succeeded the late Mr. Russell Willmott as Manager of the Isle of Wight Central Railway, is a son of the late Mr. P. Newcombe, a former Midland Railway official and grandson of the late Mr. W. L. Newcombe, who was general manager of the Midland Railway from 1857 to 1860, and goods and mineral manager from 1868, retiring from the position of goods manager in March, 1887. Mr. Newcombe, junr., entered the Midland service at Burton-on-Trent in 1899, and in 1902 joined the Lancashire, Derbyshire and East Coast Railway (absorbed by the Great Central) on January 1, 1907. In September, 1908, he became assistant to Mr. Willmott on the Stratford-on-Avon and Midland Junction Railway, and on January 1, 1912, became assistant to Mr. Willmott in the management of the Isle of Wight Central Railway.

* * *

Mr. H. E. O. Wheeler, London District Traffic Superintendent of the South Eastern and Chatham Railway, has been appointed Assistant Superintendent of the Line. Born in 1878, Mr. Wheeler is the youngest son of Judge Wheeler, M.A., J.P., K.C., and was educated at Uppingham School. He joined the Audit Accountant's Department of the South Eastern Railway, as it then was, in 1896, from which he was transferred to the District Superintendent's Office at New Cross, and, 12 months later, to the Office of the Superintendent of the Line, where his railway experience was chiefly gained during the course of 13 years' service in the various sections of that office. In 1911 Mr. Wheeler was promoted to the post of Traffic Superintendent of the London District, which position he held until the death of Mr. P. Cranefield in 1918, since when he has acted as Assistant Superintendent of the Line. Mr. Wheeler was appointed Officer of the Order of the British Empire in 1918 in recognition of his services in connection with the war.

Mr. H. E. O. Wheeler,

Assistant Superintendent of the Line, S.E. & C. Railway.

* * *

The Directors of the London & North Western Railway have appointed Mr. H. G. Burgess, of Dublin, as Principal Assistant to the General Manager at Euston. Mr. Burgess was for many years Chief of the Irish staff of the London & North Western Railway in Dublin, and upon the institution of the Ministry of Transport became the representative of that Ministry in Ireland.

* * *

Mr. Alex. G. Walkden, General Secretary, Railway Clerks' Association, has had a breakdown in health and ordered a complete rest and change. He is taking a holiday in Norway. Mr. Walkden was in the service of the Great Northern Railway from July, 1889, until he left in June, 1906, to take up his present position. He is a member of the Railway Advisory Committee associated with the Ministry of Transport.

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MR. J. H. RICE, who has retired from the Assistant General Managership of the North Staffordshire Railway, was born at Prestbury, near Macclesfield, in 1839. He commenced his railway career in 1852 as a goods clerk in the joint service of the London and North Western and North Staffordshire Railways, at Macclesfield. Afterwards becoming

MR. J. H. RICE,

Assistant General Manager,
North Staffordshire Railway,
1882–1920.

chief goods clerk at Macclesfield in 1861, he was appointed chief rates clerk in the district office of the London and North Western Railway at Manchester, which position he retained for some time, but owing to temporary ill-health he was transferred to outside duties, ultimately becoming, in September, 1866, chief clerk to the district goods manager at Stafford. After nearly 10 years in that office he was made chief clerk to Mr. Martin Smith, upon that gentleman moving from Stafford to Stoke to take over the duties of traffic manager to the North Staffordshire Railway. In February, 1876, Mr. Rice commenced his labours in the headquarters department at Stoke Station, where he has remained for a period of 44 years. Upon the decease of Mr. Martin Smith in 1882, Mr. W. D. Phillipps became manager to the North Staffordshire Railway and Mr. Rice assistant manager, so that he has occupied that responsible post for 38 years, latterly serving under Mr. F. A. L. Barnwell.

MR. W. H. EDGE, of the Great Central Railway Secretary's Office, has retired after 53¼ years' service in the department. The officers of the company have marked the occasion by a presentation in the Board Room at Marylebone Station. Sir Sam Fay, in asking Mr. Edge to accept the gift, which took the form of a mahogany-cased clock with lever movement, referred to Mr. Edge's long and faithful service; his literary and local interests, and the close regard in which he was held by those who had come into association with him. Mr. Oliver S. Holt, the late secretary, expressed his appreciation of the assistance which Mr. Edge had at all times given him during his many years' secretaryship of the company. Mr. Edge thanked Sir Sam Fay and Mr. Holt for their kind expressions, and also those who were associated with the gift, and Mr. Rostern, the Chief Goods Manager, for the thoughtful way in which he had arranged the matter. Mr. Edge said that his father

MR. W. H. EDGE,

Secretary's Department,
Great Central Railway,
1866–1920.

had been in the service and his son and grandson were at the present time also with the Great Central Railway. Amongst those present were: Sir Sam Fay, O. S. Holt, Esq.; C. A. Rowlandson, Esq.; E. A. Clear, Esq.; J. Rostern, Esq., C.B.E.; W. Clow, Esq., C.B.E.; J. A. Campbell, Esq.; R. Rigby, Esq.; C. W. Neele, Esq.; and S. L.

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MR. GLYNNE ROBERTS,

Chief Clerk to the General Manager, L. & N.W.R.

Murgatroyd, Esq. Regrets for unavoidable absence, and expressions of goodwill were received from Messrs. R. Watkin; D. H. Davies; J. G. Robinson, C.B.E.; R. Haig-Brown; C. C. Gatenby; T. C. Higgins; R. Salomonson; A. Puleston; A. W. Longden; W. Williams; and Commander F. Barwick, O.B.E. The clock bore the following inscription: "Presented to W. H. Edge, Esq., by the Officers of the Great Central Railway, as a token of their regard and esteem on his retirement from the service of the company, July 31st, 1920."

* * *

MR. GLYNNE ROBERTS, Chief Clerk to the Chief Goods Manager of the London and North Western Railway, has been appointed Chief Clerk to the General Manager. Mr. Glynne Roberts has had a very varied railway career commencing in the Goods and Coaching Departments at Holyhead Station in 1896, being transferred two years later to the District Traffic Superintendent's Office at Chester and in 1900 became Staff and Confidential Clerk to Mr. H. G. Burgess, the then Irish Traffic Manager of the London and North Western Railway at North Wall, Dublin. In 1902 he was appointed Outdoor Clerk in the Outdoor Goods Manager's Office at Manchester, being made an Outdoor Assistant to Mr. F. T. Kinsman in 1908. Mr. Glynne Roberts came to Euston in 1911 and after serving three years on the Chief Outdoor Goods Manager's Staff was made Chief Staff Clerk to the Chief Goods Manager. In

MR. H. M. KINSELLE.

Indoor Assistant to the Chief Goods Manager, L. & N.W.R.

MR. W. E. PRESTON, O.B.E.,

Chief Indoor Assistant to the Chief Goods Manager, L. & N.W.R.

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October, 1917, he was appointed Assistant Head of Staff Department in the General Manager's Office, being re-transferred to the Chief Goods Manager's Office as Chief Clerk in February, 1918.

* * *

Mr. W. E. Preston, Indoor Assistant to the Chief Goods Manager of the London and North Western Railway, has been appointed Chief Indoor Assistant. Mr. Preston entered the service of the London and North Western Railway in 1888 at Berkhamsted Station, and after a few years in the Northampton District, which included some time in the Northampton District Goods Manager's Office, he was transferred to Euston on January 1, 1894. The early training which Mr. Preston received at the stations and District Goods Manager's Office stood him in good stead later on in the important positions he was destined to fill in the headquarters offices at Euston. After six years in the Assistant Goods Manager's Department at Euston he entered the Chief Goods Manager's Office in June, 1900, was made Chief Clerk in May, 1914, and became Indoor Assistant to the Chief Goods Manager in May, 1918. For services rendered during the war Mr. Preston was, in 1918, awarded the O.B.E.

* * *

Mr. H. M. Kinselle, Chief Clerk to the General Manager of the London and North Western Railway, has been appointed Indoor Assistant to the Chief Goods Manager. Although Mr. Kinselle commenced his railway career in the Expenditure Office at Euston, practically the whole of his services have been given in the General Manager's Department, where he has served with distinction, being made Chief Clerk to the General Manager in 1914. Mr. Kinselle is also Secretary to the London and North Western and Great Western Joint Officers' Conference, to which position he was appointed in 1913.

* * *

At a meeting of the Conference of Goods Managers of the Railway Companies of the United Kingdom, held at the Railway Clearing House, a presentation was made to Mr. F. P. Igglesden, who recently retired from the position of Chief Goods Manager to the South Eastern and Chatham Railways Managing Committee. The gift took the form of a solid silver salver, and in making the presentation Mr. R. L. Wedgwood, C.B., C.M.G., Chairman of the Conference, said that the goods managers were glad to have the opportunity of testifying to the quiet and persistent work which had been characteristic of Mr. Igglesden, who had always effectively represented the position of the South Eastern and Chatham Railway. Mr. Igglesden had settled at Deal, where he would be able to enjoy his favourite hobby of sea fishing. Mr. Igglesden, in replying, said he would always treasure their handsome present, and would carry away with him the most pleasant recollections of his association with the Goods Managers' Conference.

* * *

We regret to announce the death at his residence in Putney of Mr. Frederick Walker, late Assistant to the General Manager of the London, Brighton and South Coast Railway. Mr. Walker, who retired in 1916, entered the service of the Brighton Company in December, 1872, after holding a position on the Great Western Railway. He was appointed Chief Clerk to the Gener Manager's Office on January 1, 1897; cels Manager on May 1, 1905; and General Manager's Assistant on July 1, 1910.

THE LATE MR. F. WALKER,

Assistant to the General Manager, L.B. & S.C. Railway, 1910-16.

* * *

At their new headquarters, Leplay House, 65, Belgrave Road, London, S.W. 1, the members of the Railway Club will assemble on Friday, September 10th, at 7 p.m., to hear an address by Mr. L. Hiller, of Tyer and Co., Ltd. Mr. Hiller's subject will be railway signalling, and this function will

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commence the autumn session of the club. It is intended to hold general meetings of members on the second Friday evening in each month, but the club is open daily and its valuable railway reference library is in constant use. Since the armistice was signed in November, 1918, the membership has doubled, and both London and country members are finding Leplay House a most valuable rendezvous. RAILWAY MAGAZINE readers who desire the advantages of the Club during the coming winter should communicate without delay with the hon. sec., Mr. Basil M. Bazley

* * *

MR. EDWIN J. MILLER, who has been Hon. Secretary of the Railway Club for 10 years, has resigned his position owing to his inability to attend completely to the many activities of the Club and its growing membership. Mr. Miller will retain his seat on the Committee, so that the Club will continue to have the benefit of his ripe and valuable experience.

* * *

So far as railways are concerned, clause 5 (i) (e) of the Increase of Rent Act should be borne in mind. It is the result of an amendment introduced by Dr. Addison to provide for the case of a statutory undertaking, such as a railway company requiring possession of houses for the purpose of its work. The clause provides that where the "landlord" is a local authority or statutory undertaking" and the dwelling-house is reasonably required for the purpose of the execution of its statutory powers and duties, the court may make an order for recovery of possession and for ejectment of the tenant; but the Court will only do so if satisfied that there is suitable "alternative accommodation" for the tenant in the neighbourhood. An attempt was made to do away with this last proviso in this particular case, but it was defeated.

* * *

IN printing the August RAILWAY MAGAZINE the fifths of seconds dropped out of the table on page 99 (*see* Lord Monkswell's article, "The H se-Power of French Locomotives"), alt gh they are correctly printed in the first table on page 97. This may have created the erroneous impression that the timing was less carefully done. As regards the table on page 99 the seconds column should be as follows: 32, $3\frac{4}{5}$, $35\frac{3}{5}$, $7\frac{3}{5}$, $39\frac{4}{5}$.

* * *

IN reply to various questions as to whether it was just to raise fares when railwaymen were allowed to travel free, it has been pointed out on behalf of the Government that the Minister of Transport is bound by Section 7 of the Transport Act, which retained to the staff of the railways during the period of control the privileges which they had at the time of the passing of the Act.

* * *

WRITING on "Future of the Railways," Sir Robert Perks remarks:—"Railway nationalization is co-ordination carried to excess. I am no believer in State control, because I have seen it at work in many parts of the world. Everywhere I have found it inefficient. In many lands it has been abandoned. It is not good for the traveller, nor for the employee, and it is bad for the trade of the country and for public finance."

* * *

ALTHOUGH it was at first feared that the work would not be completed this year, it is now hoped that the new subway and stairs for tube passengers at Charing Cross Underground station will be in operation by the end of September. When complete, this subway will be used only by passengers from District platforms and street, to the Bakerloo and Hampstead Tubes. Passengers from the tubes to the street and District platforms will use the existing stairs and subway. Congestion will thereby be avoided, as up and down passengers will use entirely separate stairs to and from the street and platforms. The alterations include a new footbridge over the District platform, and a new stairway from this footbridge to the west-bound platform, with an additional exit on to the Embankment. It is hoped to complete the footbridge by the end of November.

* * *

AT Victoria Underground station, London, it is proposed at an early date to construct at the west-end of the station a footbridge and stairways, connecting both platforms with a new exit in Terminus Place. This will tend greatly to relieve the congestion on the platforms at this station and incidentally provide a quick approach to the London, Brighton and South Coast and South Eastern and Chatham Railway stations.

* * *

To relieve congestion on the Waterloo and City Tube and to assist the London and South Western Railway in its heavy task during the rush hours, morning and evening, on working days, the London General Omnibus Company have strengthened 'bus service76 between Waterloo and the City. Extra 'buses are now on this route and work short journeys between

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Liverpool Street and Waterloo Station at five minute intervals, the additional 'buses running between 8 and 11 a.m. in the mornings, and 4 p.m. and 6.30 p.m. in the evenings. The terminal points for this addition to Service 76 are the Underground Station at Liverpool Street, and Mepham Street (adjacent to the Underground Station in York Road) at Waterloo. On the way to Liverpool Street the 'buses deviate from their usual route at London Wall and go via Bloomfield Street. From Liverpool Street they proceed by New and Old Broad Street and Threadneedle Street and thence by the usual route to Waterloo station.

* * *

IN 1913 the amount paid out in wages to the employees of the London Underground Railway Companies was £2,000,000. It is estimated that the wages bill for this year will exceed £6,000,000, an increase therefore under this heading of £4,000,000, or 960 million pennies. Petrol, which in 1913 cost the companies £400,000, will cost them this year at least £1,400,000, an increase of at least a round million pounds, or another 240,000,000 pennies. It will be seen from these two items alone that the Underground in common with other concerns has a very heavy burden to shoulder.

* * *

THE "Safety First" movement is truly world-wide. The London "Safety First" Council has recently added to its roll of subscribing members the Shanghai-Nanking (Chinese Government) Railway. Copies of the Council's familiar posters have been despatched to Shanghai, and it is understood that these are to be remodelled and translated to meet local requirements.

* * *

SIR ERIC GEDDES, Minister of Transport, recently received a deputation from the Isle of Wight in respect to improved means of communication between the Island and the mainland. The deputation introduced by Sir Douglas Hall, M.P., pointed out the hardship sustained by the inhabitants in being cut off from the mainland, especially during periods of bad or foggy weather, when communication by sea was impossible, and this drawback militated against the Island being developed as a health resort, and interfered with the marketing of produce. They also considered the present means of transport by steamers as being inadequate and out of date. The deputation considered that the best solution of the present difficulty was to construct a tunnel under the Solent which would enable communication to be maintained with the Island at all times, and obviate the inconvenience and discomfort experienced at present. In reply, Sir Eric Geddes said that at the present price of labour and materials, the cost of constructing a tunnel under the Solent would be upwards of £2,000,000, and he was doubtful if the revenue would be sufficient to make the tunnel self-supporting. The policy of the Government, Sir Eric explained, was to avoid subsidies and he suggested that the deputation should investigate the question whether the prospective traffic through the tunnel would justify the expenditure of this large sum of money.

* * *

DURING the recent gasworkers' strike at Bristol, the Great Western Railway had to requisition oil lamps from rural stations to assist in the lighting of Temple Meads. As these bore the names of the owning stations, the first impression created on the uninitiated traveller was one of perplexity, if not of alarm.

* * *

AN interesting law case concerning railway refreshment rooms has been brought to a conclusion. In 1853 a railway company gave a lease of land at Carlisle Railway Station to a lessee for 999 years on the terms that he should erect and keep a hotel there. The lease contained a covenant by the company that the tenant of the hotel should have the option of renting the station refreshment rooms in preference to anyone else, "it being the intention and wish of the parties that the same person should have the option of occupying both the hotel and refreshment rooms." The plaintiffs occupied the hotel as assignees of the lease. They also occupied the refreshment rooms as yearly tenants, until the London and North Western Railway, who were the successors of the lessor railway, gave them notice, purposing to take over the refreshment rooms themselves. The plaintiffs claimed that they were entitled to remain in occupation of the refreshment rooms under the covenant. The House of Lords has now affirmed the decisions of both the Court of Appeal and of Mr. Justice McCardie, that the option did not apply, seeing that the defendants here purposed to carry on the refreshment rooms themselves. It was only enforceable in case the defendants had proposed to let in some outsider to rent the refreshment rooms.

* * *

A FURTHER five new London and North Western engines of the four-cylinder "Claughton" class will shortly be running, Nos. 1726, 1741, 1747, 2035 and 2083. These belong to the batch referred to in the August

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issue. Of the preceding series, Nos. 2179 and 2511 are now stationed at Camden and Nos. 1599 and 2499 at Carlisle. No. 1933 *Barfleur* ("Jubilee" class) has been converted to "Renown" class (two cylinder simple), while No. 2578 *Fame* ("Precursor" class) is now superheated.

* * *

THE LONDON, BRIGHTON AND SOUTH COAST RAILWAY announce that arrangements have now been made for through registration of baggage to the principal stations in Switzerland. The Customs examination will be at Dieppe and on the Swiss frontier.

* * *

A PASSENGER train which arrived at Littlehampton on Wednesday afternoon, August 4, was unable to stop at the platform, and after crashing through the buffer-stop, forced its way through a brick wall and across a roadway. There were no cases of injury sufficiently serious to require medical attention. A breakdown gang from Brighton speedily removed the engine from the roadway.

* * *

ON the Great Western Railway the July time-table alterations have effected the restoration of the slip-coach service on the 11.15 a.m. from Paddington, due at Bath at 1.13 and recently known as the "Bath Spa Express." For several months past this train has called at Bath after a non-stop from Paddington, but since July 12th the pre-war practice of slipping coaches has been resumed.

* * *

AMONG the many welcome indications of the gradual return of pre-war railway conditions may be mentioned the smarter appearance of the main-line passenger rolling-stock of the Great Western Railway. In common with all our important lines, the company's ideal in maintenance is to regard the train itself as a complete unit; and, in addition to the uniformity of outline which is a characteristic of the principal Great Western through trains, their appearance is now being enhanced by the renewal of the distinctive chocolate brown livery. So far, however, the painting of the locomotive stock does not show that richness of detail which it possessed in pre-war days. The elaborate panelling is seen no more, and much of the ornamental brasswork has disappeared. The Company's coat-of-arms is no longer met with, so that, although none would deny that the modern Great Western locomotive possesses "the pomp of power," it bears no longer "the boast of heraldry."

IN the case of the remaining Great Western Railway 2-4-0 engines of the "3206" series, the disappearance of the brass work around the splashers alters their appearance very considerably. These engines, many of which were rebuilt with domeless boilers some years ago, now carry domed boilers very similar to the original pattern.

* * *

IN a letter to *The Times*, Mr. E. A. Gurney-Smith, whose name is well-known to most of the readers of the RAILWAY MAGAZINE, advocates the introduction of more simple third-class carriages as a solution of one of the railway difficulties of the day. Is there, he asks, any country, except our own, in which the working man, who may perforce have to travel home in his working clothes, is obliged to do so in the highly-upholstered third-class compartments provided on our trunk railways? The necessity is extravagant and insanitary. In most European countries before the war—of which Switzerland is the best instance—on ordinary trains, many of them quite fast ones, where the provision of the three classes presented no complications, all were to be found, and the seats of the third-class were quite comfortable, but made of some washable material, such as wooden slats. In the very fastest expresses, where it was specially desirable to get as paying a load as possible, and in cases of rather complicated through services, the two higher classes only were provided. On all our trunk lines, let there be two classes, with the fares the raised ones, but on our ordinary trains—including fairly fast ones, but not the very fastest, such as the "Cornish Riviera" and "Flying Scotchman" expresses (which should be limited) nor on certain complicated through services—let there be a third-class corridor (where the other carriages are corridor), with compartments of washable seats, at the old penny-a-mile fares. Sufficient people will pay for the greater speed and comfort to supply the revenue needed.

* * *

THE Department of Colonization and Development of the Canadian Pacific Railway has, for a number of years, carried on a general intelligence service for Canada through the medium of a Bureau of Information at Chicago and by the publication at Calgary, Alberta, of a weekly newsletter, *Western Canada Week by Week*, and an annual bulletin, *Business and Industrial Opportunities*. It has been decided to assemble at headquarters a most complete and comprehensive library of information about Canada, with smaller, but equally well-equipped, libraries at each of the

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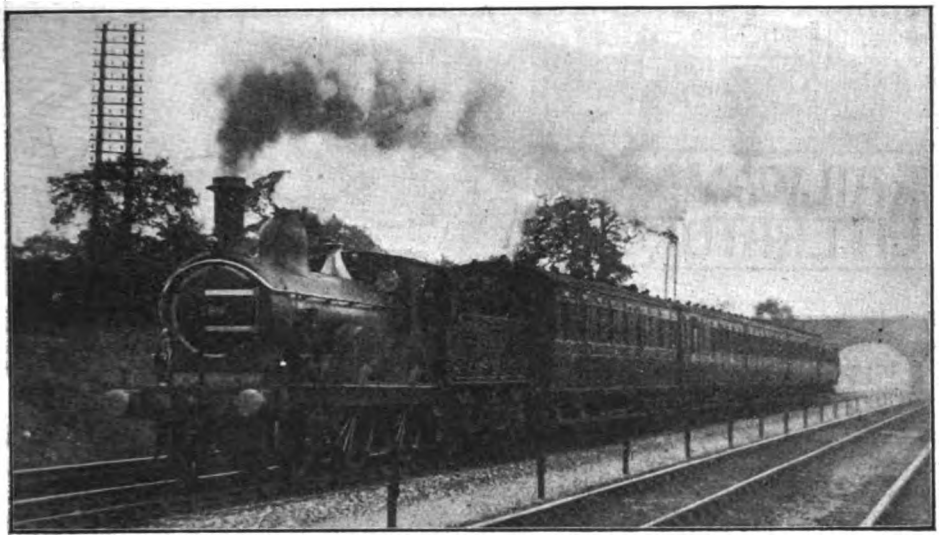

MIDLAND RAILWAY.

Train from St. Pancras to St. Albans. 2-4-0 locomotive, No. 169.

branches. A monthly bulletin, entitled *Agriculture and Industrial Progress in Canada* will be issued, which will take the place of the publications *Western Canada Week by Week* and *Business Opportunities*, which are at present issued by the Department. This monthly bulletin will be supplemented, from time to time, by the issue of condensed leaflets containing general information of interest and valuable for reference purposes. In addition to the publication of the monthly review, it is proposed to issue from Montreal each month loose-leaf statistical charts containing comparative figures relative to crops, mineral production, imports and exports, bank clearings, labour conditions, and other information of value for reference purposes.

* * *

It will interest travellers to Canada to know that the Grand Trunk Railway System has renewed the arrangements made effective last year, whereby passengers holding Grand Trunk Rail Orders, or Coupon Tickets, arriving at Quebec, are now handled via the Canadian National Railways—*i.e.*, over the New Quebec Bridge route to Montreal, thence Grand Trunk Railway to destinations in eastern and western Canada. Trains run direct from the ship's side, and Grand Trunk officials meet passengers, and give every attention and assistance possible to passengers holding Grand Trunk tickets. The use of the Ferry service between Louise Embankment Wharf and Point Levi for passengers arriving by Atlantic steamer has been entirely abandoned.

* * *

We have received from the Agent-General for Victoria, Australia, copies of booklets published respectively by *The Industrial Australian and Mining Standard*, Melbourne (price 5s. net), and *The Commonwealth Engineer*, also of Melbourne (price 2s. 6d. net), describing the Melbourne Suburban Railway electrification which formed the subject of an article in the June, 1920, Railway Magazine.

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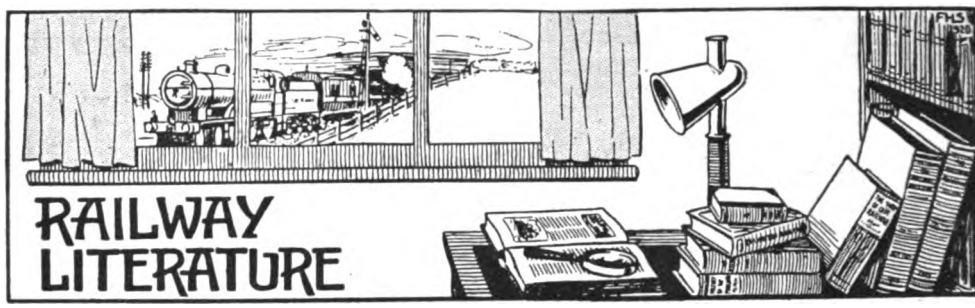

THE ENGINEERING ENQUIRY. By Tomey Thompson. [J. W. Arrowsmith, Ltd., 11, Quay Street and 12, Small Street, Bristol. Price, 7s. 6d. net.] Somewhat in the style of an engineering pocket-book, this volume strikes a new line in that it sets forth the data which is essential before an enquiry can be dealt with by a firm manufacturing engineering plant. As is pointed out, it so often occurs that further correspondence is required before a reply can be given, owing to the omission of essential information. Reference to this volume should avoid this, as prospective purchasers are clearly shown what data is essential. A wide range is covered alphabetically, and much useful information is included incidentally. Well-produced, we welcome this addition to the engineer's and manufacturer's library.

YELVERTON (DEVON) WITH ITS SURROUNDINGS. [The Homeland Handbooks. Price 9d. net.] This addition to the useful series of pocket guides and local directories published by The Homeland Association, Ltd., 37 and 38, Maiden Lane, Covent Garden, London, W.C. 2, will be welcomed by prospective and past visitors to the picturesque part of Devonshire so ably described by Messrs. E. Francis and B. Thomas. Plans, maps and photographic reproductions amplify the concise yet complete letterpress, and we have pleasure in commending this pocket volume, and its predecessors concerned with other holiday districts of the Homeland, to our readers.

FIFTY YEARS OF RAILWAY LIFE IN ENGLAND, SCOTLAND AND IRELAND.

By JOSEPH TATLOW.

The main purpose of this volume is to relate the recollections and experiences of an officer who began his active career as a junior clerk more than half a century ago; was afterwards in the service of various railways, great and small, in England, Scotland and Ireland; attained at a comparatively early age to the position of general manager; is now a railway director.

"His book is eminently readable. He enlivens his pages with many personal experiences and charming character sketches."—*The Spectator.*

"His genial talk in which much solid information is contained—besides kindly drawn pictures of many railway magnates—should interest a wider public than that to which it is primarily addressed."—*The Times Literary Supplement.*

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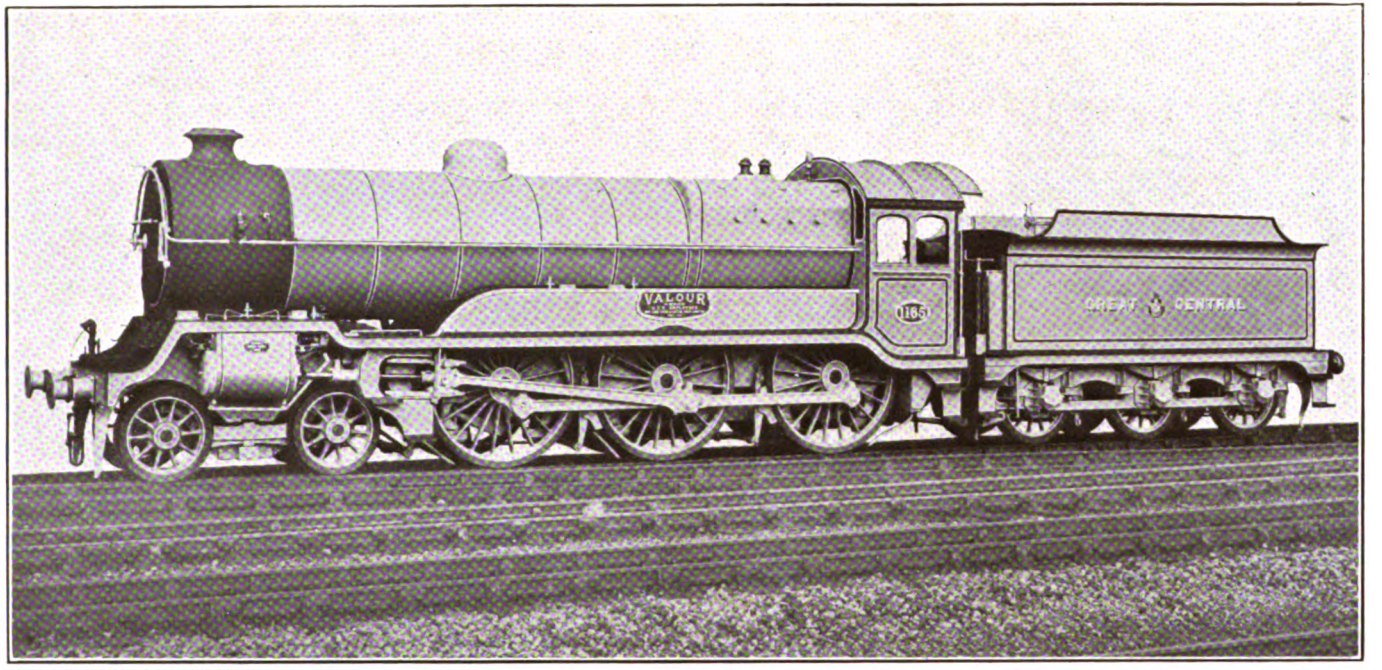

GREAT CENTRAL RAILWAY
MEMORIAL LOCOMOTIVE No. 1165, "VALOUR."

"In memory of G.C.R. Employees who Gave their Lives for their Country, 1914-1918."

Designed by Mr. J. G. ROBINSON, C.B.E., Chief Mechanical Engineer.

Cylinders (4), 16 in. by 26 in. Coupled wheels, 6 ft. 9 in. diam. Steam pressure, 180 lb. per sq. in. Heating surface—Tubes (large), 678 sq. ft.; Tubes (small), 1,203 sq. ft.; Firebox, 159 sq. ft.; Superheater, 343 sq. ft.; Total, 2,383 sq. ft. Grate Area, 26 sq. ft. Weight in working order—Engine, 77 tons 18 cwt.; Engine and Tender, 126 tons 4 cwt.

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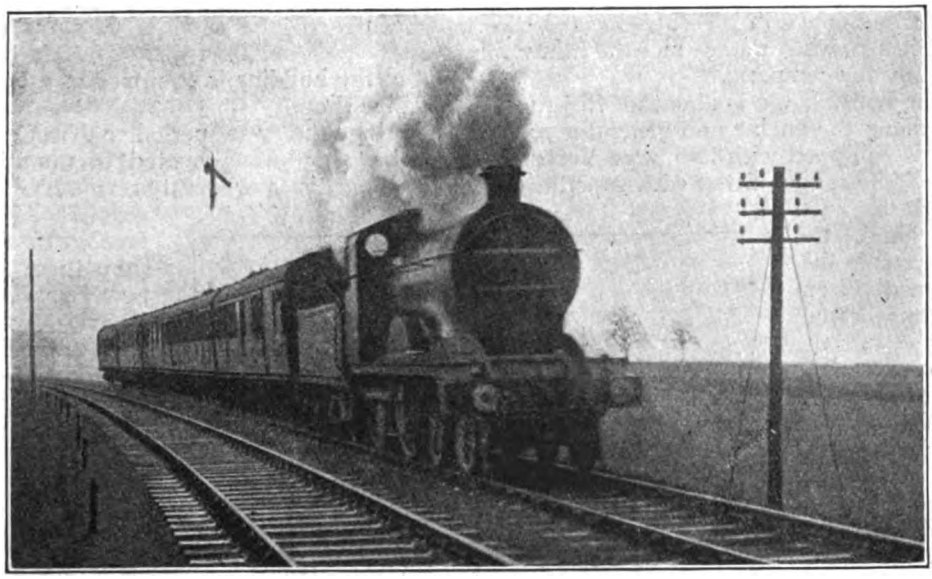

Photo.] HULL & BARNSLEY RAILWAY. [*K. A. C. R. Nunn.*

4-4-0 locomotive No. 35, on Sheffield-Hull Express.

The Hull & Barnsley Railway Works at Springhead, Hull.

WITH SOME REFERENCE TO THE LOCOMOTIVES AND ROLLING-STOCK.

By EDWARD BEAL.

OFFICIALS and employees of the Hull and Barnsley Railway are indeed fortunate in the matter of the location of their sphere of duty, the general locomotive and rolling-stock works of the company being situate at Springhead, at a point between Hull and Willerby, on the main line to Cudworth. The works deal with the repair and—when the need occurs—the rebuilding of both locomotives and wagon stock, and the repairing of passenger coaches, there being merely small repair shops at Hull (Alexandra Dock) and Cudworth.

The present Locomotive Superintendent is Mr. Matthew Stirling, M.I.M.E., M.Inst.C.E., the honoured son of the late Mr. Patrick Stirling of Great Northern fame. Mr. Stirling assumed command of his department on the Hull and Barnsley on May 18, 1885.

The works occupy a large area of land adjoining the Springhead sidings. The general offices are centrally situated, and include Mr. Stirling's headquarters, drawing office under Mr. H. Cook, enquiry office, &c.

Passing from the offices to the main central block, we reach the moulding and pattern shop—a building 60 ft. by 40 ft. roughly, provided with four underground furnaces and core ovens. In this building there are two lathes as well as a suitable bandsaw, both propelled by an electric motor serving this shop. There is also a 30-cwt. wall-crane for handling heavy castings.

The coppersmiths' shop comes next in order, and has about the same dimensions. It is provided with three brazing furnaces for welding copper tube ends, &c., for locomotive boilers. In the same shop

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with the coppersmiths are located the tinsmiths, who make all the tinware used by the company.

The boiler house is about 40 ft. square, excluding the engine and generator room, and is equipped with two large Yorkshire type boilers, each fitted with superheater, which are fed by hand, the fuel being discharged from wagons through doors in the front of the building. The whole of the machinery for the locomotive department is driven by this battery. Adjuncts thereto include economisers, located within a small bay near the engine house. The engine room adjoining is equipped with one Blowett-Lindley vertical engine, to which is coupled a 230-volt Siemens' dynamo. An important feature of the engine room is the air-compressor in one corner, serving the various pneumatic tools and appliances. The main switchboard occupies a portion of one wall.

Elliott [*& Fry.*

MR. MATTHEW STIRLING, M.Inst.C.E., M.I.Mech.E.

Locomotive, Carriage and Wagon Superintendent, Hull & Barnsley Railway.

Mr. Matthew Stirling, son of the late Mr. Patrick Stirling, was born at Kilmarnock in 1856, and was educated at Kilmarnock, Doncaster and Ayr. Having served an apprenticeship at the Doncaster locomotive works of the Great Northern Railway, in 1880 he went to the Nottingham district to take up the appointment of assistant to the District Superintendent there. In 1883 he was transferred to the Peterborough district as assistant to the District Superintendent. In May, 1885, Mr. Stirling joined the Hull and Barnsley Railway as Locomotive Superintendent, and has held the office ever since. He is a member of the Institution of Civil Engineers and of the Institution of Mechanical Engineers.

The oil store is an independent building 25 ft. from the main block, and is entirely fireproof.

The machine shop and turnery is well supplied with grinding, shaping, moulding, milling, planing, drilling and automatic machines. A wired-in compartment in the centre of the shop is used for the custody of small tools. The further end of the building is equipped as a brass machine shop.

During the war period half of the erecting shop was devoted to munition work, but is now refitted to serve its normal purpose. In this shop there are two 40-ton electric overhead travelling cranes. There are three tracks giving an accommodation together of 1,080 ft. Each length of track is fitted with inspection pit. The wheel and motion shop adjoins the erecting shop and contains one wheel press, two gas heaters for expanding tyres, and all the usual appliances.

In the boiler shop—a building 150 ft. by 55 ft.—are suitable punching and shearing machines, a stay-lathe, drilling machines for tube-plates, &c., and sundry pneumatic tools such as hammers and drills. These tools are connected by metallic flexible hose to various wall-couplings provided along the whole length of the building. The smithy opens upon the boiler shop and contains two Massey and one Thwaite steam hammers of 10-cwt., 3-ton and 5-ton capacity respectively, as well as large wall cranes worked by

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manual power, one to every two fires. Steel racks and scrap bins are situated behind the smithy

Springhead, as well as being the repair depôt for locomotive stock, deals efficiently with both goods and passenger vehicles. Mr. Thomas Sanderson, the wagon and carriage works manager, has grown up with the work at the depôt. The wagon shop is a good sized brick building, 335 ft. in length, and 90 ft. in width, possessing six repair tracks as well as seven outside sidings with necessary turntables, &c. Through this shop, about three vehicles pass every week, on an average, as rebuilds, as well as the highest possible number of repairs. The shop will readily accommodate 100 vehicles

The carriage repair shop is also of brick, and is 175 ft. long by about 50 ft. in width, covering three tracks. The painting and finishing of the carriage stock is also executed here. Up to the present it has not been seen fit to rebuild any of the passenger vehicles, the management deeming it a wiser plan to secure new stock of the latest design, fitted with up-to-date improvements, converting the older stock as the need occurs into useful work-cars, &c. The majority of the older ones consists of four-wheeled 30-ft. coaches which are being replaced by bogie corridor stock. The carriage shop is therefore devoted entirely to repairing and repainting. The more recent passenger coach acquisitions have been built by the Birmingham Railway Carriage and Wagon Company. All re-lacquering, &c., is done by Messrs. George Clark and Sons, of Hull. Within this shop are two 15-ton overhead travelling cranes as well as the usual jacks, &c., for repair work.

Behind the carriage shop on the north side is a track and platform for carriage washing. The platform runs the full length of the shop and affords access to the coach sides. A disused locomotive boiler is mounted vertically at one end of the track, and is used to supply hot water for cleansing purposes. There is also a vacuum cleaner of considerable capacity, driven by an independent electric motor. Adjacent to the shop is a paint store and a coke pile, as well as a pay office and print shed, the latter attached to the drawing office.

GENERAL VIEW OF WAGON SHOP.

The wagon machine shop is reached *via* large double doors at the end of the repair shop. The building covers an area of 135 ft. by 75 ft. In the north-east corner is a large Robey engine of the inverted type, coupled direct to the shafting.

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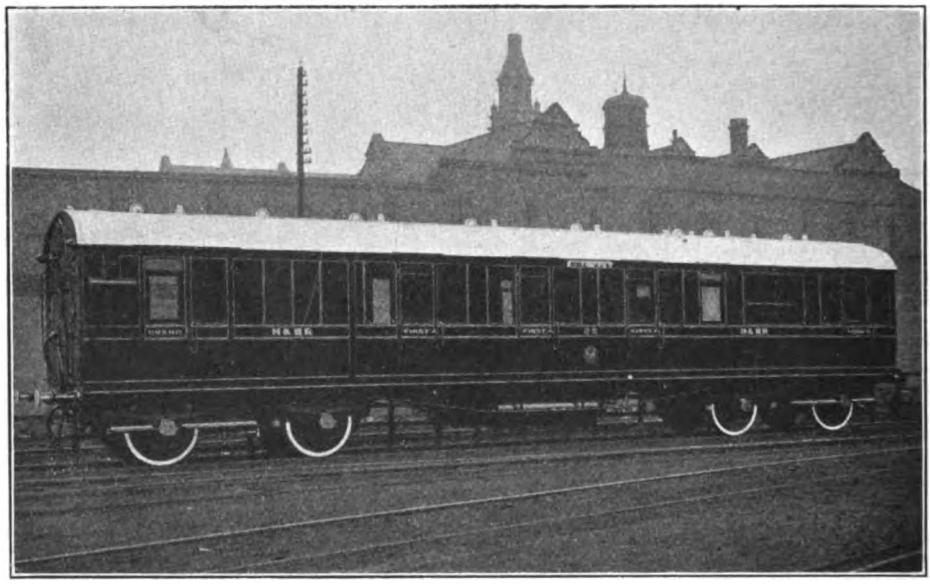
There are many interesting tools and machines, including four wheel-lathes, boring machines, circular saws, three drilling machines, two screwing machines, a wheel press and a wheel balancer, along with a gas heater for expanding wagon tyres.

The wagon boiler house adjoins the building and contains one multi-tubular boiler, which is fed by hand, fuel being supplied from an adjacent track. There are two timber stores, one being the old wagon shop, which was operative when Mr. Sanderson took charge, and which only accommodated three wagons. The depôt. Several open wagons were ready for despatch at the time of this visit, and very neat and trim they looked. The shop includes all necessary tools and implements. A small section at the south-eastern corner of the building is set aside for the storage of bolts, nuts and standardized accessories. A large business is done at the eastern end of the shop in the repairing of hundreds of hand-barrows for the King George Dock at Hull.

Altogether the works are exceptionally well-kept and well-organised. There is no overlapping, no wastage and no



STANDARD BRAKE COMPOSITE BOGIE CARRIAGE.
Built by the Birmingham Railway Carriage & Wagon Co., Ltd.

second timber store is a new building consisting of a roof and side-and-corner supports, the sides being open. Together, these stores afford a roofed housing space 82 ft. by 60 ft. square.

As a rule, rebuilt vehicles practically amount to new stock after having passed through the department. For instance, it is generally necessary to provide new tyres, thoroughly to overhaul the bodies, and to substitute new planking for old wherever necessary; all axle grease boxes are replaced by the latest pattern of oil box, the wheels, underframe, ironwork, &c., are well cleaned up and the wagon repainted and lettered before it leaves the unnecessary handling of material or products. Possibly one of the most outstanding features of an organisation of this order, of fairly modest proportions, is that everything wears such a neat and orderly appearance; whereas with very large layouts things may readily become involved and the despatch of work thus suffer.

For the comfort and convenience of employees, there is a large mess room with the necessary larder and kitchen utensils for the cooking or warming of food. This is a well-lighted brick building about 100 ft. in length and 60 ft. wide. The works are a considerable distance

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from the various residential quarters of Hull, or the nearest car terminus, and the mess room is very useful to those who prefer to stay behind for lunch. For those who cycle to and fro, there is a large cycle shed near the main offices. Mr. Stirling's special saloon train runs in to Beverley Road Station, Hull, every day to bring the superintendent to the works, and this is also placed at the disposal of a number of clerks who avail themselves of this conveyance to dinner. The train stops at various convenient places to pick up or set down. Attached to the rolling-stock department are 185 employees.

For the running department there is a 55-ft. girder-type turntable in the north-west corner of the depôt. This machine is of the unflanged wheel type, revolving in a pit.

The coaling stage is a brick erection 185 ft. in length. Wagons are run up an incline to a high level track, accessible at either end by a staircase. The upper storey of the building is open along the whole of its frontage and at the ends, the necessary handrails being fitted. The side doors of the wagons are dropped, and a couple of men shovel the fuel into barrows which are turned round, pushed to the side of the stage and their contents fed into the locomotive tender beneath. In the case of tank engines the locomotive is backed into a dead-end siding near the stage, and coal is supplied over the end. There are five water cranes or standpipes along the frontage of the coaling stage, and these are manipulated by wheel cocks from the high level, the enginemen being thus saved the trouble of dismounting from the footplate. The water pipes are fed from a large water-softening plant situated in front of the steam shed.

Adjacent to the coaling stage, and on a dead-end siding behind the erecting shops, is kept the breakdown train—always coupled up ready for immediate service—and the snow plough. As a general rule, this latter machine is an unnecessary feature so far south as Holderness, but there is a stubborn cutting near Little Weighton Station, which frequently becomes heavily choked with drifts. The plough is of the usual V-shape and is attached to the buffer-beam of a six-coupled goods locomotive.

Sand is prepared and supplied to locomotives at two sand-drying houses in front and rear of the steam shed, the furnaces of the sand houses being also used for fire lighting. The steam shed provides accommodation for about 70 engines in working order. The locomotive check office occupies the north-west corner of the shed. Outside the building is an Avery three-section weighbridge and house.

There are, inclusive of drivers and firemen, about 800 employees attached to the locomotive department.

A few of the more prominent locomotive types in use may now be briefly mentioned. The outstanding feature of all Hull and Barnsley engines is the absence of the dome which usually occupies the centre of the boiler top. This is due to a belief on the part of Mr. Stirling that the dome is always an unnecessary feature so long as steam is taken from the boiler at a point sufficiently high for the steam itself to be as dry as practicable—a theory also held by Mr. Matthew Stirling's father when locomotive superintendent of the Great Northern Railway.

One of the principal classes is the 0-8-0 tender goods design. Several of these engines have been loaned to the North Eastern Railway, where they are rendering good service. Coupled wheels are 4 ft. 6 in. diam., those of the tender being 3 ft. 9 in. Cylinders are 19 in. by 26 in., wheelbase 16 ft. 6 in., capacity of tender tank 3,300 gallons. The following are the more important dimensions and details :—

Working pressure ..	180 lb. per sq. in.
Total length over buffers	53 ft. 7¾ in.
Weight in running order (engine only)	61 tons 11 cwt.
Tender weight in running order (coal and water)	39 tons 8 cwt.
Total weight in running order (engine and tender)	100 tons 19 cwt.

These engines are fitted with a new type of cab, with protruding roof and straight sides.

There are 10 engines of the 0-6-2 radial tank type, all built in 1913 and 1914. They are numbered as follows: 13, 15, 18, 23, 27, 152-156 inclusive, and are of

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the class known as F 3. The following are the outstanding details :—

Cylinders	18 in. by 26 in.
Wheelbase (coupled) ..	15 ft. 6 in.
Working pressure ..	170 lb. per sq. in.
Coupled wheels (diam.)	4 ft. 6 in.
Total length over buffers	35 ft. 10 in.
Weight in running order	61 ton 9 cwt. 1 qr.
Weight light	45 ton 16 cwt. 3 qr.
Trailing wheels (diam.) ..	3 ft. 9 in.
Heating surface—	
Tubes	904 sq ft.
Firebox	104 sq. ft.
Total	1,008 sq. ft.
Grate area	16·26 sq. ft.
Tender tank capacity ..	2,000 gallons.
Fuel capacity	3 tons.

These engines were built in 1910 and are used on the main line passenger traffic between Sheffield and Hull, &c.

It should be stated, however, that the chief traffic on this line is in minerals. To meet the heavy demands of this service several six-coupled engines with tenders have been put to work. These consist of classes L, Ll, and Ls, and number about 20. The latter type (class Ls.) are superheated and are five in number (20, 21, 22, 26, 28). Class L, while substantially of this type, are not fitted with superheaters. All these five have force-feed lubricating apparatus,

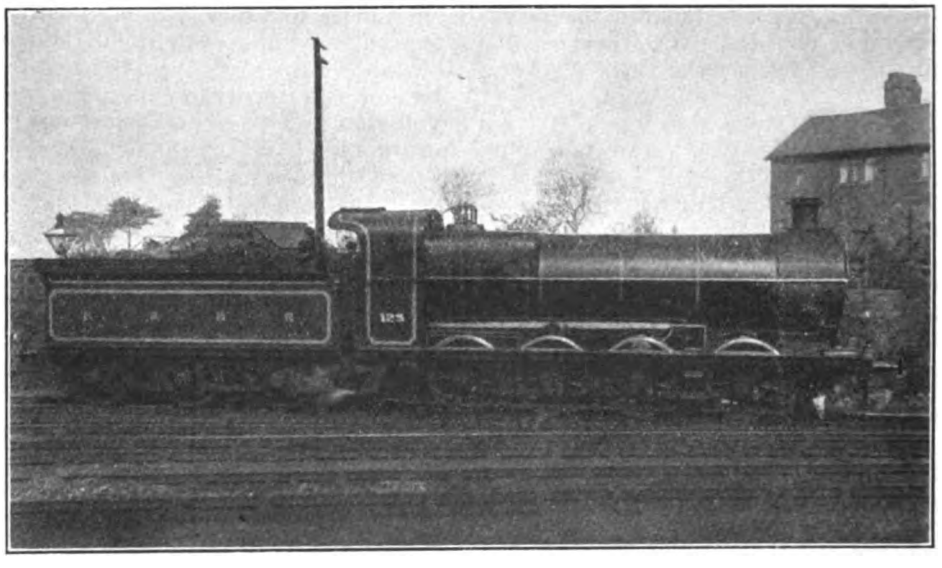

Photo.] 0-8-0 MINERAL LOCOMOTIVE No. 125. [*G. Robinson.*

The new 4-4-0 tender passenger engines, of which five are now in use, are numbered 33, 35, 38, 41 and 42, and known as class J.

Cylinders	18½ in. by 26 in.
Coupled wheels diameter	6 ft. 6 in.
Bogie and tender wheels	3 ft. 9 in
Working pressure ..	170 lb. sq. in.
Heating surface	1,407 sq. ft.
Grate area	19·6 sq. ft.
Coupled wheelbase ..	9 ft. 3 in.
Tender tank capacity ..	3,500 gallons.
Fuel capacity	5¼ tons.
Engine weight in running order	55 tons 2 cwt.
Tender in running order	40 tons 10 cwt.
Total weight running order	95 tons 12 cwt.
Length over buffers (engine and tender) ..	54 ft. 0 ¾in.

whereby a small oil pump is operated by a lever, coupled to the motion of the engine. One or two of these six-coupled engines were originally fitted with the Phœnix superheater, being provided with extended smokeboxes, &c.; but have recently been re-arranged according to their original pattern. Leading dimensions of the class L locomotives (Nos. 157-161), are as follows :—

Cylinders	19 in. by 26 in.
Coupled wheelbase ..	17 ft.
Wheels (coupled) diam. ..	5 ft.
Wheels (tender) diam. ..	3 ft. 9 in.
Working pressure ..	170 lb. sq. in.
Heating surface	1,407 sq. ft.
Grate area	19·6 sq. ft.

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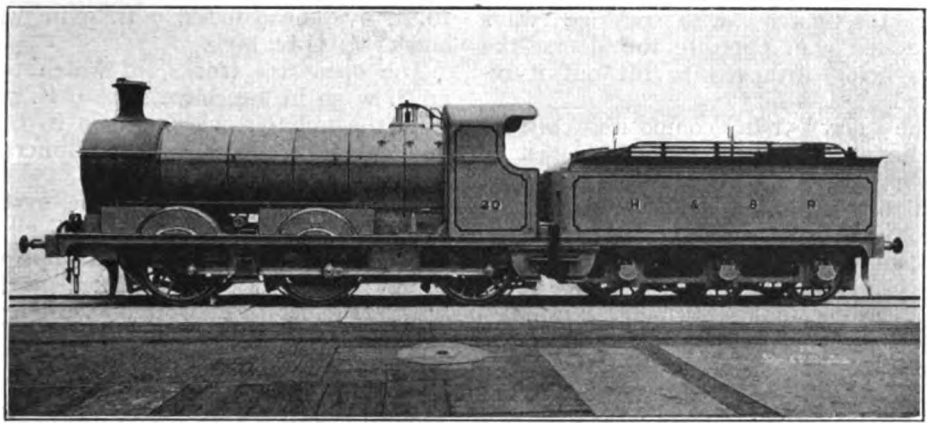


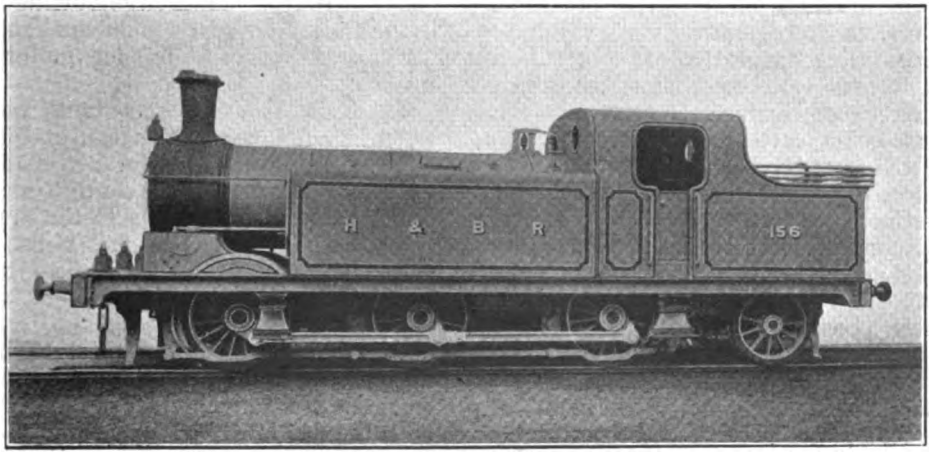
0-6-0 GOODS LOCOMOTIVE No. 20.
Built by Kitson & Co., Ltd.

Tender capacity—	
Tank	3,500 galls.
Fuel bunkers	5½ tons.
Length over buffers (engine and tender) ..	50 ft. 11¾ in.
Weight in running order (engine and tender) ..	91 tons 5 cwt.

The colouring of Hull and Barnsley locomotives is "invisible green" which appears black, with bright blue rectangular panelling having red borders. Lettering is in gold leaf with blue shading. The total number of locomotives now in service is 168.

The finish of the passenger stock of the Hull and Barnsley Railway is very effective, consisting of hard teak polish with gold-leaf lettering having blue shading. Roofs and wheel rims are white.

As already stated, the old four-wheeled stock of the company, instead of being scrapped, is being refitted to meet the requirements of the different branches of the repair departments. Two of the coaches now run as signal and telegraph department vans. The insides are entirely removed, save for one partition, six of the doors are built up, suitable seat lockers added and the completed van painted light chocolate colour. A dozen of these carriages were converted into very successful fruit vans, trays being fitted waist



0-6-2 TANK ENGINE No 156.
Built by R. & W. Hawthorn, Leslie & Co., Ltd.

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high throughout, with passage ways across the van opposite the doors, the trays being arranged to lift out if required.

The new 51-ft. composite corridor coaches were supplied in 1909. They have two lavatory compartments in the centre, with first-class accommodation at one end and third at the other. They are particularly roomy and comfortable coaches, and others of the same type are in use as brakes, ordinary third-class and first-class coaches. Colouring of the wagon stock is, normally, dark lead for the body with white lettering and black underframe. The refrigerator vans are white with black letters and underframe. Carriage trucks and vans are light chocolate with gold leaf lettering and black underframe.

The 15-ton loco. coal open wagon is a vehicle in much demand, seen in large numbers at all northern coaling centres. It is 21 ft. long over buffers, with a wheelbase of 10 ft., length over headstocks 18 ft. The wheels are of 37 in. diam., and the body is 8 ft. in width.

An interesting vehicle is the 10-ton, 18-ft. open wagon. This is 21 ft. over buffers, with sides only 3 ft. 6 in. high, and having a width of 7 ft. 3 in. in round figures. It has a cubic capacity of 387·7 ft. The covered goods wagon is 16 ft. over headstocks and 8 ft. wide over all. It is fitted with four louvred vents in the side walls and six Eros vents on the roof.

The insulated meat van is, in so many words, a refrigerator van without a refrigerating apparatus. It is fitted with six torpedo vents and, along with refrigerator vans, carriage trucks, fish vans, horse boxes, cattle trucks and gas wagons, as well as many open wagons and covered goods, is fitted with screw couplings, and continuation pipes for the automatic vacuum and Westinghouse brakes. These pipes enable the vehicles to be coupled up with trains on other railways. In some cases power brakes are fitted on the vehicles as well as the usual hand lever-brakes. The wheels are 3 ft. 7 in. diameter, enabling the wagons to be run with passenger trains. The refrigerators are of similar construction but have 10 torpedo vents in roof. Both types are 16 ft. over headstocks, 7 ft. 9 in. wide, and 11 ft. 4½ in. high.

The open fish trucks, of which there are now 30 in use, have sides 6 ft. 7 in. from the rail top, wheelbases 9 ft. 6 in., and a total length over buffers of 19 ft. 6 in.

The special functions of the system, as a railway are the linking up of all the great trunk lines which run to the northern counties with the city and port of Hull, and supplying direct communication with the continent, through that port, to all the inland industrial centres. The lettering of open and covered goods wagons in use bears witness to this latter traffic by the legend "Continental route *via* Hull." The number of goods vehicles owned by the Hull and Barnsley Railway is 5,400.

There are a dozen horse boxes of the usual type, 19 ft. over headstocks, and 7 ft. 10 in. wide over all. There are five flat carriage trucks in use, and they are fitted with special shackles at the ends of the laminated springs, for the reduction of vibration. These are 24 ft. 8 in. over all in length, 12 ft. 6 in. wheelbase, have 3 ft. 7 in. wheels and both the ends and the sides are arranged to drop, the former over the buffers. There is one large covered carriage van that was made exclusively by the company at Springhead. It is no less than 13 ft. 3 in. in height from the rails, and has a wheelbase of 16 ft. The side walls are of vertical matchboarding, and there are two small doors in the sides and large double doors in the ends. This car is numbered 79, and has proved very useful for motor car traffic.

There is also one gas tank wagon, which is employed in the regular conveyance of gas from Cannon Street, Hull, to the chief centres of the south Yorkshire coalfield for supplying gas to the miners' trains. The vehicle has dual tanks, and measures 22 ft. 2 in. over buffers, has a wheelbase of 11 ft., with a total width of 8 ft. 0½ in.

In conclusion, mention must be made of Mr. L. Hyde, who is the able and energetic assistant-in-chief to Mr. Stirling, and thanks must be expressed to Mr. Cook, who accompanied the writer on his review of the depôt.

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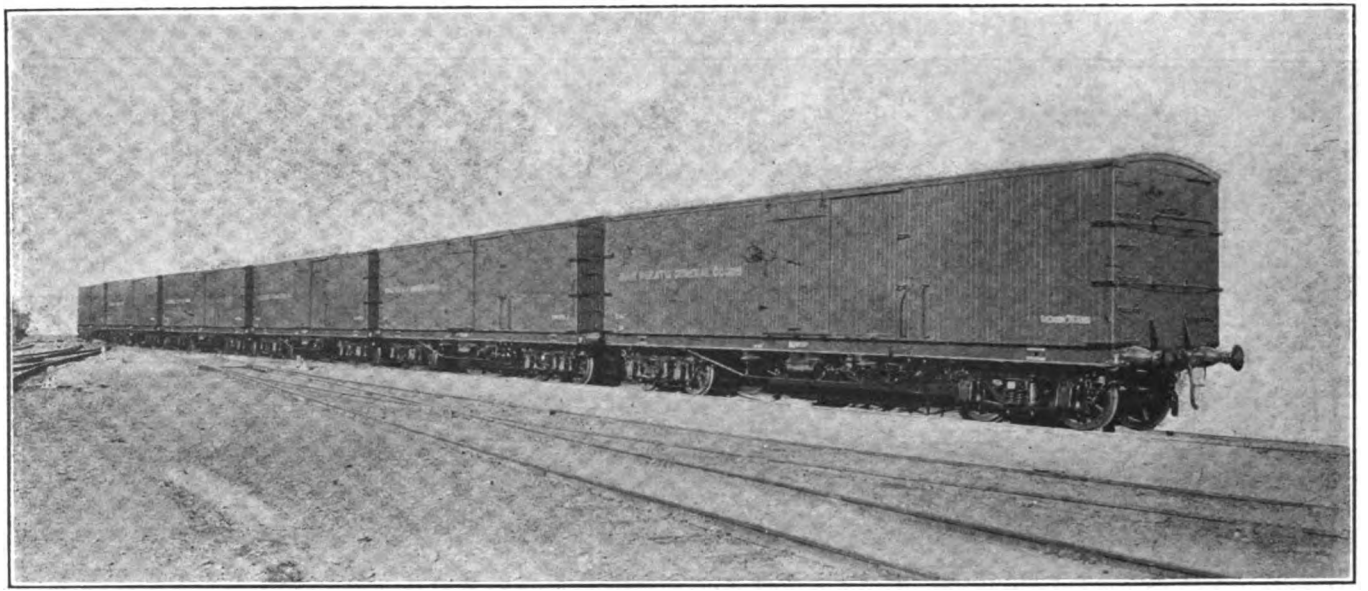
BOGIE COVERED WAGONS FOR CARRIAGE OF BULK WHEAT AND GENERAL TRAFFIC: NEW SOUTH WALES GOVERNMENT RAILWAYS.



NECESSARILY the great Colonial railways require equipment of an up-to-date character, and the set of six 36-ton bogie covered wagons illustrated is representative of rolling-stock specially built to meet the needs of traffic passing in large volume on the railways concerned. Fifty of these wagons are in use on the New South Wales Government lines.

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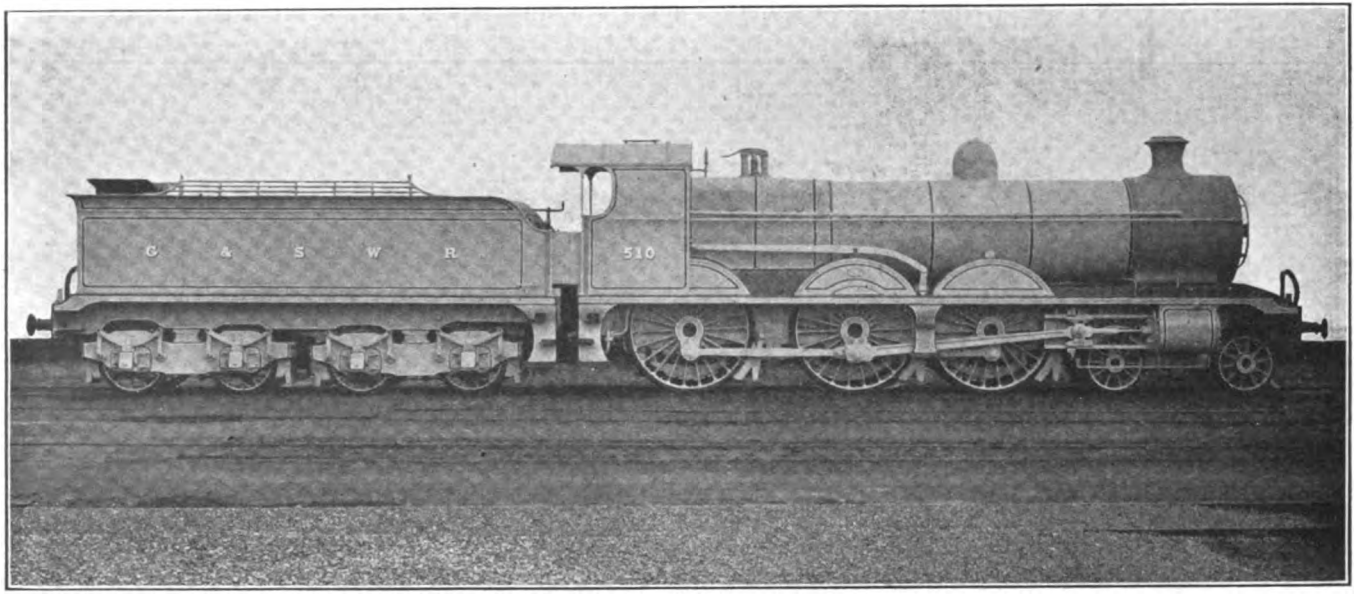
4-6-0 EXPRESS PASSENGER LOCOMOTIVE, GLASGOW & SOUTH WESTERN RAILWAY.

Designed by Mr. J. MANSON and Rebuilt by Mr. R. H. WHITELEGG, Locomotive Engineer.



Leading Dimensions.

Cylinders	20 in. by 26 in.	Heating surface—firebox ..	140 sq. ft.
Coupled wheels	6 ft. 6 in. diam.	Heating surface—tubes ..	1,721 sq. ft.
Bogie wheels	3 ft. 3 in. diam.		
Coupled wheelbase ..	15 ft.	Total	1,861 sq. ft.
Engine wheelbase	27 ft. 8 in.	Grate area	27 sq. ft.
Steam pressure	180 lb per sq. in.		

Total weight in working order: Engine, 67 tons 19 cwt.; engine and tender, 117 tons 10 cwt.

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Locomotive Rebuilding at Kilmarnock Works: Glasgow and South Western Railway.

IN order to meet modern requirements Mr. Robert H. Whitelegg, Chief Mechanical Engineer, Glasgow and South Western Railway, is rebuilding a number of the 4-4-0 locomotives of the No. 8 class, originally built to the designs of Mr. James Manson, then Locomotive Superintendent, at the Kilmarnock works in the year 1879, in order to bring them up-to-date and suited for heavy duty.

As rebuilt, these engines have been provided with a larger boiler, extended smokebox and new cab, and now constitute a new class designated No. 375.

The new type of boiler now being put into this class of engine is a standard design that will suit quite a number of varying classes, a policy that will eventually prove of considerable benefit. In future the whole of the company's stock of engines will be covered with about six types of boilers.

The boiler in question is 6 in. larger in diameter than the original one, the barrel being parallel and in two rings. The length of the firebox remains as formerly, to enable the box to be fitted between the driving and trailing axles, thus obviating constructional alteration to the frames.

Leading particulars of the 4-4-0 type locomotives before and after rebuilding are stated below.

In connection with the reconstruction of these classes of engines at Kilmarnock works the original standard valve gear, *i.e.*, Stephenson link-motion actuating a rocking shaft, is simplified as shown. This alteration makes the valve gear very much simpler and the motion direct by the elimination of six moving parts in each engine. This alteration has been found, after some months of trial, to be quite successful, and the valve setting has been found to remain true, which was not possible for long in the original gear, due to the lost motion in the larger number of working parts.

The steam reversing gear with which

	Original.	Rebuilt.
Cylinders	18½ by 26 in.	18½ by 26 in.
Coupled wheels	6 ft. 9½ in.	6 ft. 9½ in.
Rigid wheelbase	8 ft. 9 in.	8 ft. 9 in.
Engine wheelbase	21 ft. 8 in.	21 ft. 8 in.
Boiler front end	4 ft. 2 in.	4 ft. 9½ in.
Length of barrel	10 ft. 6 in.	10 ft. 6 in.
Firebox	6 ft. 2 in.	6 ft. 2 in.
Boiler centre	7 ft. 6 in.	8 ft. 3 in.
Heating surface—		
Tubes	1,094 sq. ft.	1,236 sq. ft.
Firebox	111 sq. ft.	125 sq. ft.
Total	1,205 sq. ft.	1,361 sq. ft.
Grate area	18·36 sq. ft.	18·36 sq. ft.
Boiler pressure	150 per sq. in.	170 per sq. in.
Water capacity	2,500 gallons 4 tons coal	2,400 gallons 4 tons coal
Railings added to new tender.		
Weights on coupled wheels—		
Driving wheels	16 tons 10 cwt.	17 tons 0 cwt.
Trailing Wheels	14 tons 7 cwt.	16 tons 10 cwt.
Total	30 tons 17 cwt.	33 tons 10 cwt.
Weight of engine in working order	45 tons 1 cwt.	49 tons 17 cwt.
Weight of engine and tender in working order	76 tons 11 cwt.	81 tons 7 cwt.

DIMENSIONS OF 4-4-0 LOCOMOTIVES, No. 375 CLASS, BEFORE AND AFTER REBUILDING.

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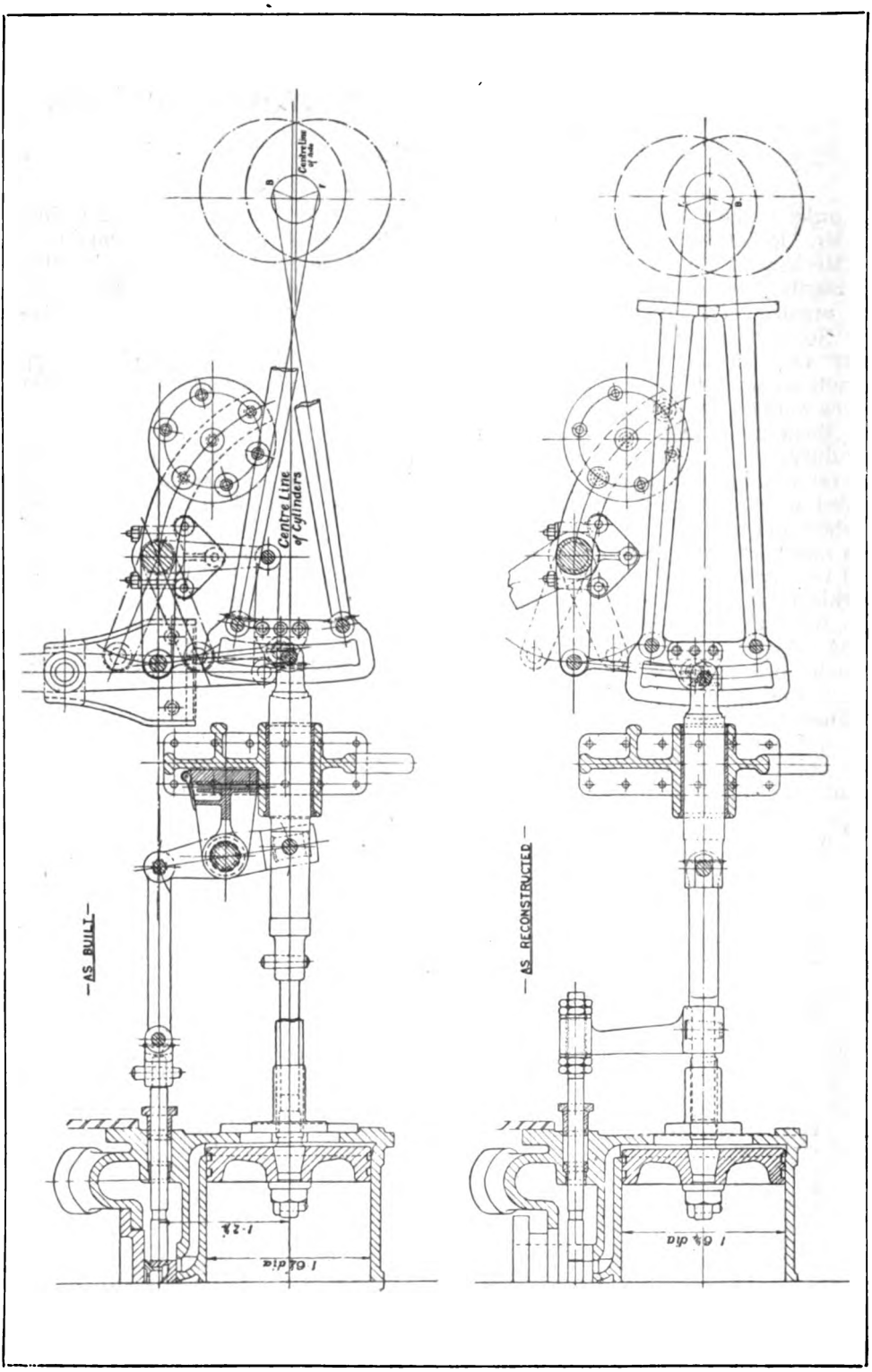

LINK MOTION VALVE GEAR AS ORIGINALLY FITTED TO GLASGOW & SOUTH WESTERN RAILWAY LOCOMOTIVES BY MR. J. MANSON, AND AS MODIFIED BY MR. R. H. WHITELEGG WHEN REBUILDING THESE ENGINES.

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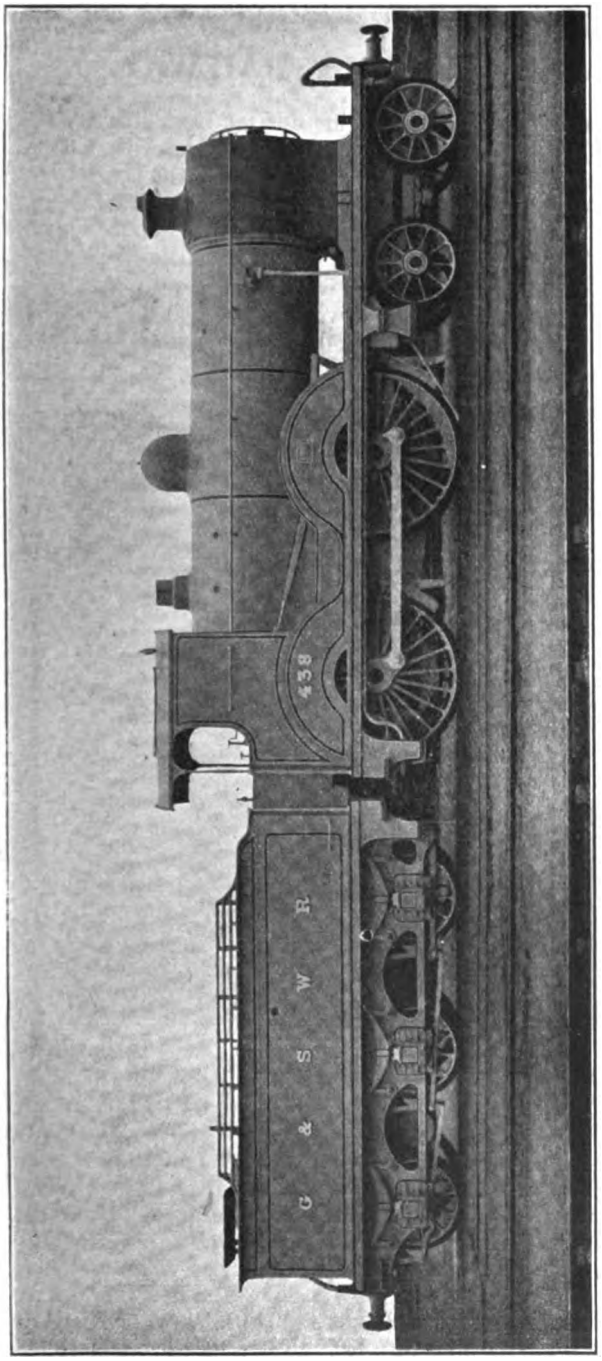

REBUILT 4-4-0 LOCOMOTIVE No. 438, GLASGOW & SOUTH WESTERN RAILWAY.

these engines have all along been fitted has also been modified and made direct instead of being actuated through a rocking lever and links, as formerly.

Several of the 4-6-0 engines in use on this line have also received new boilers, two of the class, Nos. 510 and 511, having so far been dealt with. One of these as rebuilt is illustrated on page 226.

The boiler is of the same dimensions as formerly, with the exception of having a grate area 2¼ sq. ft. more than the original boiler. An extended smokebox is also provided, and a more commodious type of cab.

Principal changes relate to the heating surfaces and grate area, and the distribution of the weight. Working pressure has been raised in the reconstructed engine, but the total weight is only a little over three-quarters of a ton more.

Tube heating surface is the same as formerly, but the firebox heating surface is increased from 131 to 140 sq. ft., making the total 1,861 instead of 1,852 sq. ft. Steam pressure is now 180 in place of 175 lb. per sq. in. The boiler barrel is 15 ft. 5 in. long, as before, but the firebox is 9 ft. long instead of 8 ft. 9 in. An extended smokebox, 5 ft. 1½ in. in place of 4 ft. 1½ in. is fitted. Total weight of the engine on coupled wheels is now 51 tons 15 cwt, an increase of 13 cwt., while 4 cwt. added to the weight on the bogie bring the total engine weight to 67 tons 19 cwt., or 17 cwt. more than when built.

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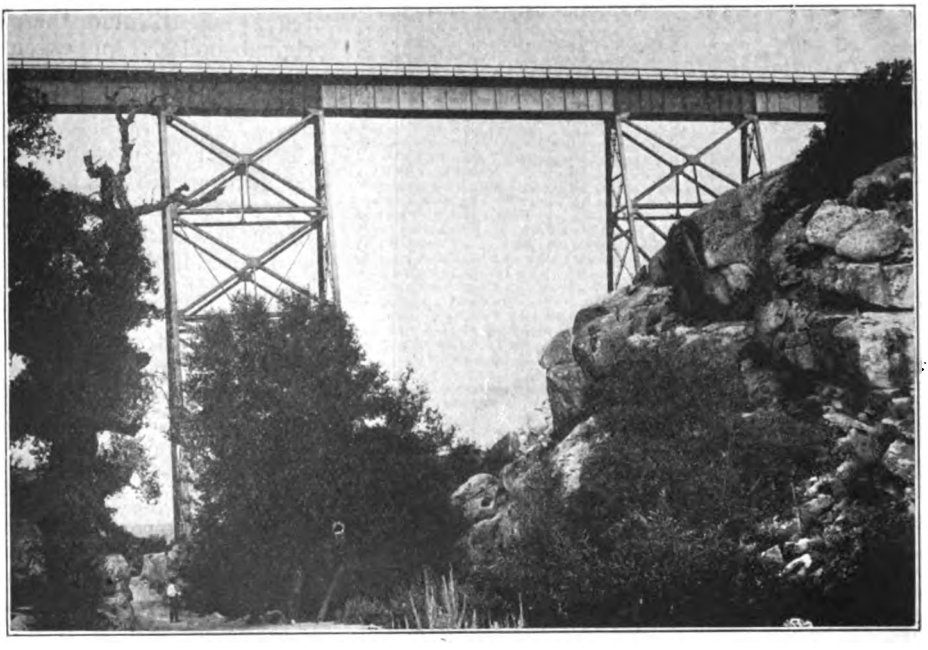
THE SAN DIEGO AND ARIZONA RAILWAY.

THIS new international line connects San Diego on the Pacific coast, California, with El Centro, in Arizona, passing far south into Mexico, and penetrates a wild region that up to the present time has been isolated from the outside world. Its construction has involved very heavy engineering works. In the Carriso Gorge, for example, near the line in the mountains not far from the border line. Then commences the descent. Loops and double loops enable the track to descend by easy grades past Hot Springs, through Carriso Pass, Dos Cabezas and Coyote Wells until at El Centro it is 51 ft. lower than at San Diego and 50 ft. below sea level.

One great advantage of this new line



STEEL BRIDGE ACROSS EL TORAH CANYON.

between San Diego and Imperial Counties, there is a 12-mile stretch that has called for the construction of 17 tunnels, with a total length of 13,412 ft., or more than 2½ miles of boring through the mountains.

The railway starts within a stone's throw of the Pacific Ocean at San Diego, strikes off to the south into Mexico, crosses the border at Tia Juana, and proceeds through very difficult country to the summit on the Tecate divide high up will be derived from the fact that it will reduce the railroad distance from Yuma, Arizona, to San Diego, California, by more than 150 miles. The former route led far to the north, through Los Angeles, then down the west coast. The new line opens a region that is rich in mineral fields. Up to the present all travel through these mountains has been by means of pack trains, but mining equipment can now be brought in readily and the great veins of ore worked.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN.
A.M.Inst. T.

Photo.] [*E. A. Gurney-Smith.*
SOUTH EASTERN & CHATHAM RAILWAY.
Up Kent Coast Express passing St. Mary Cray.
4-4-0 engine, No. 738.

AS promised in the September RAILWAY MAGAZINE, I have pleasure in giving herewith a complete table of start-to-stop journeys on the Great Western Railway scheduled in the summer time-tables at 50 m.p.h. It is considerably modified from the form in which the friend who prepared it sent it originally to me, as the working time-book revealed differences from the public times in the case of a number of the runs. As a result one of my correspondent's runs (8.27 a.m. from Chippenham to Didcot) is excluded, the working time being 50 and not 49 min., and also the 33 min. run of the 10.24 a.m. from Chepstow to Gloucester, as the accurate distance in the latter case turns out to be 27·3 miles, and not the 27½ of "Bradshaw." The inclusion of other runs, however, makes the total up to 109 runs daily, instead of the 99 mentioned last month, and shows a total daily mileage booked at 50 m.p.h. or over of no less than 6,752 miles, which, in view of post-war operating difficulties, is a most creditable figure, and very considerably above that which could be shown by any other British company at the present time. Scheduled at 54 m.p.h. or over, we have a total of 848 miles—that is, in the case of start-to-stop bookings only. If the mileage were based on passing times, of course, the figures mentioned would be appreciably higher. The journeys of slip coaches are not included in the table, as in all instances they form part of the journeys of trains already appearing. One notable omission is that of any runs on the northern main line, other than the 27-min. "snippet" from Birmingham to Leamington—the result, of course, of the 2½ hours agreed "limit" time between London and Birmingham.

As a pendant to the Great Western table, I have calculated out also the figures for the Great Central Railway. The number of expresses operating on the latter line is only a fraction of the number on the Great Western Railway, and the total of runs figuring in the table is therefore very much smaller, but with all respect to the Great Western, the quality of the Great Central running is much higher. Whereas the Great Western Railway has only one run in excess of 55 m.p.h., and that by a train carrying no passengers, the Great Central Railway

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can boast of six on week-days, and two additional, over different sections of the line, on Sundays. In consideration of the grading of the respective routes also—the Great Central as exceptional in its severity as the Great Western is in its lengths at 1 in 176 or worse grades. In comparison with this, 85 per cent. of the Great Western 50 m.p.h. runs are made wholly or in part over the most magnificently-graded stretch of line in the British Isles—between London and Taunton *via* Bath—which is for all practical purposes level throughout, save for the two short stretches at 1 in 100 down before Dauntsey and through the Box Tunnel respectively. Of the total 50 m.p.h. mileage, 65 per cent. is run over

GREAT WESTERN RAILWAY.

RUNS SCHEDULED AT 50 M.P.H. OR OVER.

From	To	Distance.	Time.	Speed.	Train.	Total trains at 50 m.p.h. or over.
		Miles.	Min.	m.p.h.		
Paddington	Swindon ..	77·3	83	55·9	2.30 a.m. D.	5
Bristol	Exeter	75·6	83	54·7	4.51 a.m. D.	4
Paddington	Oxford	63·4	70	54·4	4.45 p.m. D. (*a*)	6
Paddington	Taunton ..	142·9	158	54·3	4.00 p.m. D.	4
Paddington	Chippenham ..	94·0	104	54·2	4.10 p.m. D.	1
Badminton	Reading ..	64·0	71	54·1	12 noon U.	1
Paddington	Exeter	173·7	193	54·0	1.47 p.m. U.	2
Paddington	Bath	106·9	119	53·9	6.30 p.m. D.	3
Paddington	Worcester ..	120·4	135	53·5	1.30 p.m. D.	1
Reading	Westbury ..	59·6	67	53·4	10.16 a.m. D.	2
Reading	Bath	70·9	80	53·2	5.48 p.m. D.	1
Reading	Newport ..	97·4	110	53·1	8.45 p.m. D.	4
Newton Abbot ..	Paddington ..	193·9	220	52·9	12.25 p.m. U.	1
Cheltenham	Stratford (*b*) ..	29·1	33	52·9	11.47 a.m. U.	2
Paddington	Reading ..	36·0	41	52·7	8.45 a.m. D. (*c*)	23
Paddington	Bristol (*d*) ..	118·3	135	52·6	11.15 a.m. D.	1
Westbury	Paddington ..	95·6	109	52·6	3.41 p.m. U. (*e*)	1
Oxford	Worcester ..	57·0	65	52·6	6.02 p.m. D. (*f*)	3
Reading	Swindon ..	41·3	47	52·6	11.05 a.m. U. (*g*)	6
Paddington	Torquay ..	199·7	229	52·3	12 noon D.	1
Bristol (*h*)	Paddington ..	117·6	135	52·3	12 noon U. (*j*)	2
Reading	Taunton ..	106·9	123	52·1	2.42 p.m. D.	1
Reading	Bristol (*h*) ..	81·6	94	52·0	1.48 p.m. D.	1
Ealing	Reading ..	30·3	35	51·9	7.41 a.m. D. (*k*)	6
Birmingham	Leamington ..	23·3	27	51·8	8 trains	8
Bristol	Taunton ..	44·8	52	51·7	1 p.m. D. (*l*)	11
Paddington	Plymouth ..	225·7	263	51·5	10.30 a.m. D.	1
Swindon	Bristol (*h*) ..	40·3	47	51·4	3.58 a.m. D. (*m*)	1
Bicester	Risborough ..	18·7	22	51·0	8.53 a.m. U.	1
Swindon	Bath	29·6	35	50·7	9.17 a.m. D.	1
Didcot	Paddington ..	53·1	63	50·6	9.22 a.m. U.	1
Severn Tunnel Junc.	Paddington ..	123·6	148	50·1	3.52 p.m. U.	1
Swindon	Chippenham ..	16·7	20	50·1	10.57 a.m. D.	1
Newport	Paddington ..	133·4	160	50·0	10.25 a.m. U.	1
					Total	109

Also runs in same time at :—(*a*) 10.5 a.m. and 3.10 p.m. U. ; (*c*) 8 p.m. D. and 8.54 p.m. U. ; (*f*) 8.55 a.m. and 2 p.m. U. ; (*g*) 1.52, 7.13 and 8.52 p.m. U. ; (*j*) 5.10 p.m. U. ; (*k*) 9.11, 9.57 a.m. D. and 8.4 p.m. U. ; (*l*) 11.18 a.m. and 12.55 p.m. U.

(*d*) *via* Bath : (*e*) 2.40 p.m. D. (Sundays) in 107 min. ; (*h*) *via* Badminton ; (*b*) on-Avon.

(*m*) *via* Bath (41.0 miles) on Mondays only in same time, equals 52·3 m.p.h.

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this ideal course. These remarks must not be considered as in any way depreciating the splendid Great Western Railway speed programme tabulated; they are only intended to show how the authorities of that company are helped in its compilation by the unique grading of their principal main line.

I do not think I ever fully realised the value of this grading—or, rather, absence of grading—to the Great Western Railway, from the speed standpoint, until making a journey to Bath by the 11.15 a.m. train from London shortly before a slip coach was substituted in the summer time and the remarkable way in which the driver exactly filled out his running time at an even speed—that is, without alternately hurrying and gaining time, and then "easing" in order to lose it again. So we passed Slough in 23 min. 10 sec., Reading in 43¼ min., and Swindon, 77·3 miles, in 86¼ min., having not risen above 58½ m.p.h. until we at last touched 61 between Shrivenham and Swindon. Down the short 1 in 100 to Dauntsey we did a mere 64½ m.p.h., and the second 2 miles at the same inclination through the Box Tunnel only tempted us to 67; despite this, we stopped dead in Bath

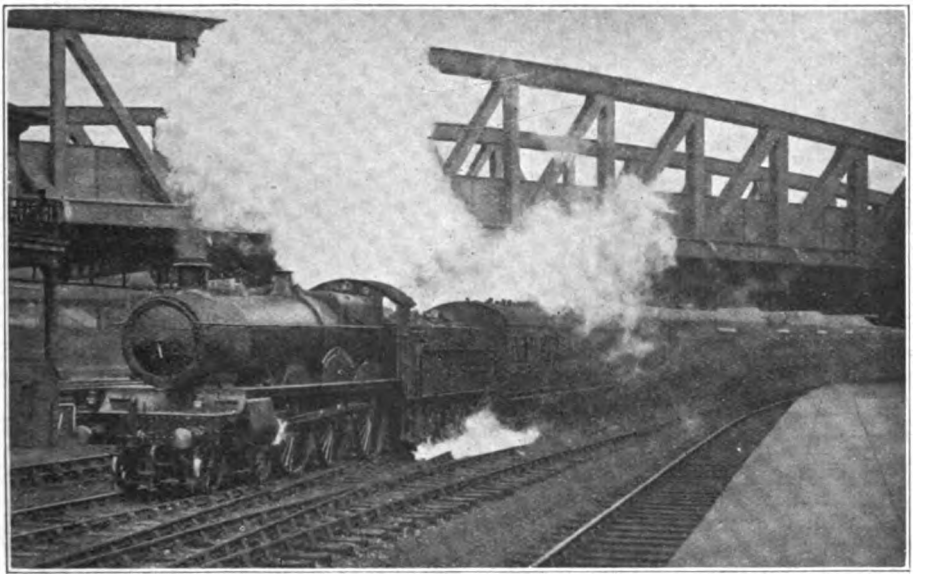

Photo.] GREAT WESTERN RAILWAY. [*F. E. Mackay.*

South Wales Express leaving Paddington. 2-cylinder 4-6-0 engine No. 2913, "Saint Andrew."

tables for the Bath stop. Here was one of the "crack" Great Western Railway schedules—for a long period subsequent to the armistice the fastest booked run of a passenger train on the system, and one which would take third place in the table if still existent—and yet, without any loss of time, we travelled for 75 miles from Paddington before so much as touching a speed of 60 miles per hour! The load was only seven vehicles—224 tons tare and about 240 tons full—and the engine was a 4-cylinder 4-6-0, No. 4000, *North Star*; but the unusual features of the running were an entire absence of checks, platform in exactly 10 seconds under our 118-minute allowance! It would be interesting to hear if any reader has ever "logged" a 54-m.p.h. run on any other line, on which time was kept, despite the fact that for three-quarters of the journey, continuously, the speed never reached the mile-a-minute rate, and on the remainder never went above 67 miles per hour. Even if somewhat dull, this was, in my experience, a unique run; most of all it showed the folly of appraising schedules on the basis of booked speed alone, without due reference to the grading of the routes over which they are run.

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By way of contrast, and as showing what an engine of the same class can and does do when put to it, let me cite a recent journey behind No. 4039, *Queen Matilda*, on the 11 a.m. express from London to Penzance. Curiously enough, this also consisted of seven vehicles (it was the first portion of the train only), and as these were all of the heaviest variety of 70-ft. stock, the tare load was 242 tons, and the gross load about 255 tons. In this case, doing 60 m.p.h., increased to 67 at West Drayton, and to no less than 72, on a virtually level track, at Slough. So we passed Slough, 18·5 miles, in 22¾ min., Maidenhead, 24·2 miles, in 26 min. 40 sec., and Twyford, 31 miles, in 33½ min., net times being about 2 min. less in each case. Then came check No. 2, at Sonning, where, after a long preliminary slowing at the home signal, we were momentarily stopped at the starter, and thus took 42 min. 25 sec.

GREAT CENTRAL RAILWAY.

RUNS SCHEDULED AT 50 M.P.H. OR OVER.

From	To	Distance.	Time.	Speed.	Train.	Total trains at 50 m.p.h. or over	
						Week-days.	Sundays.
		Miles.	Min.	m.p.h.			
Rugby	Leicester ..	19·9	21	56·9	4.13 a.m. D. ..	4	10
Woodford ..	Aylesbury ..	31·1	33	56·5	7.25 p.m. U. ..	1	—
Leicester ..	Arkwright St.	22·5	24	56·3	4.38 a.m. D. ..	1	—
Leicester ..	Nottingham ..	23·4	25	56·2	(S) 5.8 p.m. D.	10	3
Princes Risboro'	Brackley ..	27·8	30	55·6	1.8 p.m. D. ..	1	—
Rugby	Aylesbury ..	45·2	49	55·3	(S) 8.41 p.m. U.	—	1
Brackley ..	Rugby ..	23·9	26	55·2	3.45 a.m. D. ..	1	—
Finmere ..	Aylesbury ..	16·5	18	55·0	9.27 a.m. U. ..	1	—
Wycombe ..	Woodford ..	45·6	50	54·7	(*a*) 8.30 p.m. U.	2	—
Doncaster ..	Thorne ..	9·8	11	53·5	10.32 a.m. D. ..	1	—
Marylebone ..	Leicester (*b*) ..	103·1	116	53·3	3.15 p.m. D. ..	1	—
Brackley ..	Aylesbury ..	21·3	24	53·3	(*c*) 1.50 p.m. U.	2	1
Wycombe ..	Leicester ..	79·7	90	53·1	(S) 11.54 a.m.D.	—	2
Woodford ..	Rugby ..	14·1	16	52·9	(*d*) 10.25 a.m.D.	3	—
Marylebone ..	Leicester (*e*) ..	107·6	123	52·5	6.10 p.m. D. ..	1	—
Banbury ..	Leicester ..	45·2	52	52·2	12.45 p.m. D. ..	2	—
Marylebone ..	Brackley ..	59·3	69	51·6	(*f*) 2.35 a.m. D.	2	—
					Total	33	8

(S) Sundays only. (*a*) Also at 10.38 a.m. D. in same time.

(*b*) *via* Aylesbury. (*c*) Also at 12.2 p.m. U. in same time.

(*d*) Also at 11.30 a.m. and 1.55 p.m. D. in same time.

(*e*) *via* Wycombe. (*f*) Also at 5.51 p.m. U. in same time.

beyond the much greater difficulty, in relation to the grades traversed, of a schedule nominally inferior from the booked speed standpoint, it was the recovery from constant checks that added lustre to the running, and made the journey of exceptional interest throughout. The first delay occurred no further out than Old Oak Common West, where we were checked by signal, and so took 14 min. 40 sec. to Southall, 9·1 miles. But by now we were to get through Reading (36 miles), which we passed at well below the customary speed. Without checks our time to Reading would have been 36½ min.

The 5·2 miles from Reading on to Theale took 7 min. 25 sec., but from there to Bedwyn, 15·2 miles, we maintained an exact mile-a-minute average up almost continously rising grades; in fact, the clear difference in level between these two points of approximately 240 ft.

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means an average grade of 1 in 335, corresponding to the London & North Western Railway ascent on either side to Tring summit, and up this, I repeat, we were keeping up an average of 60 m.p.h. So the 11·9 miles from Theale to Newbury took 11 min. 55 sec., the 8·4 miles thence to Hungerford 8 min. 20 sec., and the final 8·6 miles up to Savernake 9 min. 5 sec., speed on the last 2 miles (2 at 1 in 180, ⅜ at 240 and ⅝ at 144) falling only to 50½ m.p.h. Savernake, 70·1 miles from London, was therefore passed in 79 min. 10 sec., or 71½ min. net, as nearly as I can estimate. The net allowance is based on our having probably passed Southall a very long and severe one for permanent-way repairs between Patney and Lavington, spoiling the descent of the best-running part of the bank. On the practically level stretch thence to Westbury we touched 67 m.p.h.; carefully reducing to exactly the 30-mile limit, we ran through the station, 95·6 miles from London, in 105 min. 55 sec. The comparatively moderate average speed of 72 m.p.h. from Patney to mile-post 94½ (from which we took 1 min. 50 sec. to the centre of the station) would have made our running time 3¾ min. less than that actually taken, and our net time to Westbury was thus in the neighbourhood of 94½ min., or under

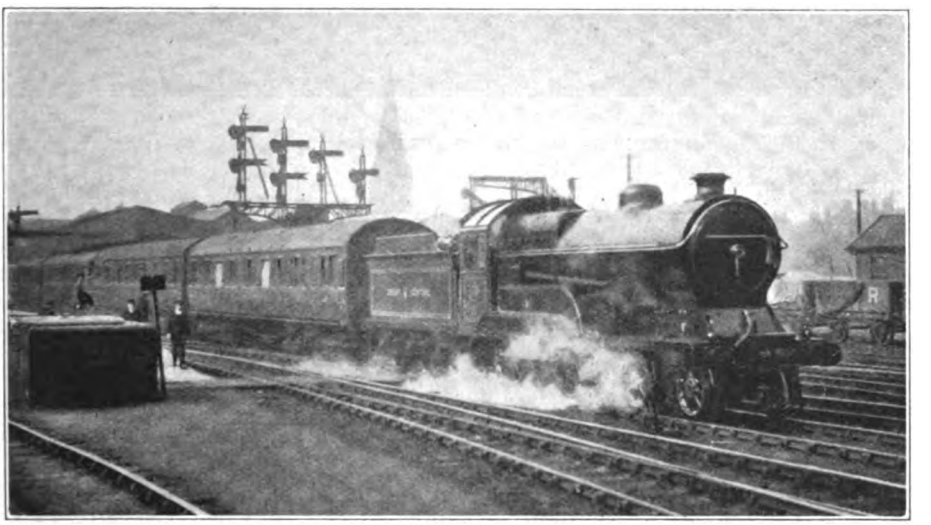

Photo.] GREAT CENTRAL RAILWAY. [*W. H. Whitworth.*

London Express leaving Guide Bridge. New 4-4-0 engine No. 506, "Butler-Henderson."

unchecked in 12 min. 5 sec., instead of 14 min. 5 sec.; of having, at a continuance of the ruling speed, run from Twyford to Reading in 4 min. 10 sec., Reading to the West Junction (0·9-mile) in 1¼ min., slacking there to 40 m.p.h., and running on to Southcote Junction, (0·9-mile further) in 1 min. 20 sec., and picking up another 5 sec. between Southcote and Theale. By this reckoning the Sonning check cost 5¾ min.

No attempt was made at regaining time by lightning downhill speeds, as the 11 miles from Savernake to Patney took exactly 10 min., with no higher rate than 74 m.p.h.; then came the third check—"even" time. Check No. 4 heralded the approach to Frome, where, at the home signal, we were held up for exactly 2 min., after we had maintained no less than 49½ m.p.h. on the preliminary 1 in 151 ascent. This was a difficult check to assess, but I put the cost at about 5½ min., by careful computation. So Westbury to Frome, 5·7 miles, took 11¾ min., and Frome (passed at a walking pace) to mile-post 122¾ summit, 7·2 miles, 9 min. 55 sec.; at the summit we were doing 49½ m.p.h. Down to Castle Cary we went very easily, shutting off steam for considerable distances on the steeper grades; at no point did we exceed 72½ m.p.h., and the maximum

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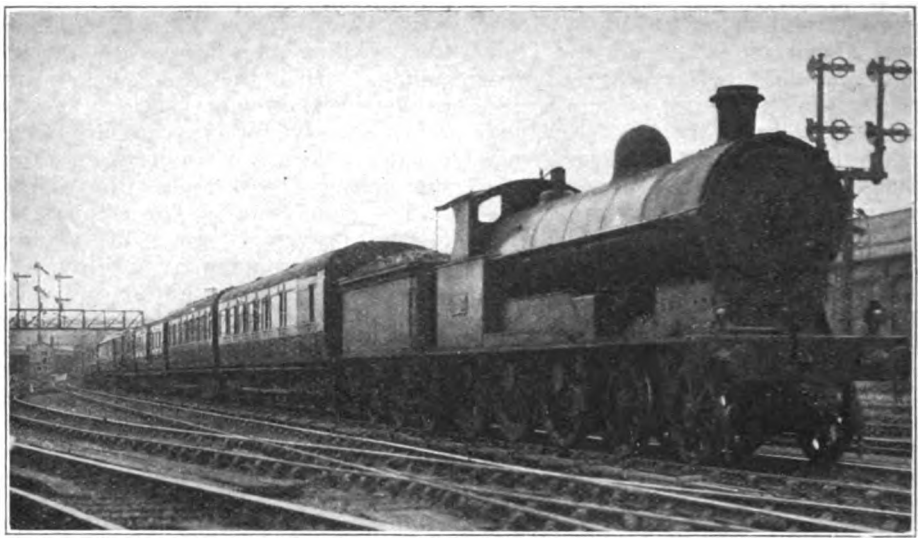

Photo.] LONDON & NORTH WESTERN RAILWAY. [*F. E. Mackay.*

12.5 p.m. Up Manchester Express, with through Lancashire & Yorkshire Railway coaches from Colne. Superheater 4-6-0 engine No. 2184.

was mostly about 70, as witness the times of 6¼ min. from 122¾ to Castle Cary, 6·8 miles, and 6 min. 55 sec. thence to Charlton Mackrell, 7·1 miles. But the 5·5 miles from Charlton to Long Sutton were run in 5 min., with a top speed of 72½ m.p.h., and the 10 miles thence to Cogload Junction in 8¾ min., with a maximum of no less than 75, sustained for some distance beyond Langport. A time of 4 min. 55 sec. on to Taunton (5 miles) made a total of 159 min. 25 sec. for the 142·9 miles from London—only 2½ min. in excess of schedule, all delays included; net time was about 142½ min.

An allowance of 38 min. from Taunton to Exeter, 30·8 miles, is, of course, extraordinarily ample, despite the climb to Whiteball; consequently our running began to be eased materially. On the 2¼ miles up at 1 in 81–90 and the subsequent ¾ at 125 through the tunnel speed fell to a shade over 29 m.p.h., the time from Taunton to Whiteball, 10·9 miles, being exactly 14 min.; thence we ran in the most leisurely fashion down the tempting stretch of line towards Exeter, the 4·3 miles from Whiteball to Tiverton Junction taking 4 min. 40 sec., and the 8·4 miles from there to Silverton 8 min. 5 sec. Then came the fifth and last check —signals badly on at Stoke Canon, causing the 7·2 miles from Silverton to Exeter stop to take 9¼ min.; but the gross time from London, 173·7 miles, after five serious delays, was, *mirabile dictu*, only 25 sec. over the 3¼ hours allowed! That is to say, delays aggregating in cost no less than 18 min. had been saved in the running, leaving a net time of 177 min. —3 min. under the best pre-war time—and this could have been cut with the greatest ease by at least 5 min. by faster running down the banks, especially those from mile-post 122¾ and Whiteball summits. This was one of the most delightful journeys I have had for many a long day, and forms a fitting companion to the extraordinary trip up from South Wales recorded in the January number.

Just to show that running well up to pre-war standards is being performed when necessary on a number of lines to-day, I will follow on with a few random runs in various directions. Of these the next was a London and North Western journey, on the 11·5 a.m. from Euston to Manchester, which, with its summer portions for Keswick and Windermere, carries a substantial load. When I boarded the

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train, indeed, it was made up to 54 axles, but at the last moment a van next the engine was detached, leaving 12 vehicles, of 381 tons tare weight, and about 405 tons full. No. 1670—an unnamed 4-6-0 "Prince"—was the engine, and the marshalling arrangements just referred to made us over 3 min. late in starting. But we got away finely, passing Willesden, 5·4 miles, in 10 min. 10 sec., Harrow, 11·4 miles, in 16 min. 35 sec.; Watford, 17·5 miles, in 23 min. 10 sec.; Boxmoor, 24·5 miles, in 30¾ min., and Tring, 31·7 miles, in 40 min. 10 sec. In comparing this with the Great Western start, it must, of course, be remembered that from Euston to Chalk Farm the line rises at 1 in 70, while the major part of the distance between Willesden and Bushey, and also between Watford and Tring, is rising at 1 in 330. It is remarkable to note that on the first 1 in 330 ascent, some 9 miles long, our speed fell only from 58½ to 53½ m.p.h.; after touching 61½ m.p.h. at Watford, however, we went more easily up to Tring, falling to 43½ m.p.h. at the summit. From Tring we went moderately down to Bletchley, not exceeding 70½ m.p.h., but by completing this 15 miles in exactly 15 min., to the stop, we made the Euston-Bletchley run of 46·7 miles in 55 min. 10 sec., instead of the 59 min. allowed. Thus in this short distance we had more than extinguished our late start, despite our substantial load.

Another excellent start was made from Bletchley, Wolverton, 5·8 miles, being passed in 8¾ min., at 62·5 m.p.h., while the minimum rate on the 1 in 330 up to Roade, passed in 16 min. 35 sec. (13·2 miles), was 51 m.p.h. Thence we covered the 3 miles to Blisworth in 3 min. 10 sec., the 6·8 miles on to Weedon in 6 min. 40 sec. (maximum 62½ m.p.h.), and the 5·6 miles up to Welton in 5 min. 55 sec., the lowest speed on the ascent to Kilsby Tunnel being 51 m.p.h. So we passed Welton, 28·6 miles from Bletchley, in the good time of 32 min. 20 sec., and I do not doubt that a non-stop trip from London, on the basis of this running, would have taken us through Rugby in 91 min.—the schedule of the pre-war 10·30 a.m. out of Euston. But at Rugby we came in for some very serious delays, having apparently overhauled the 10·40 a.m. from Euston to North Wales, and so were momentarily stopped at Hillmorton, and

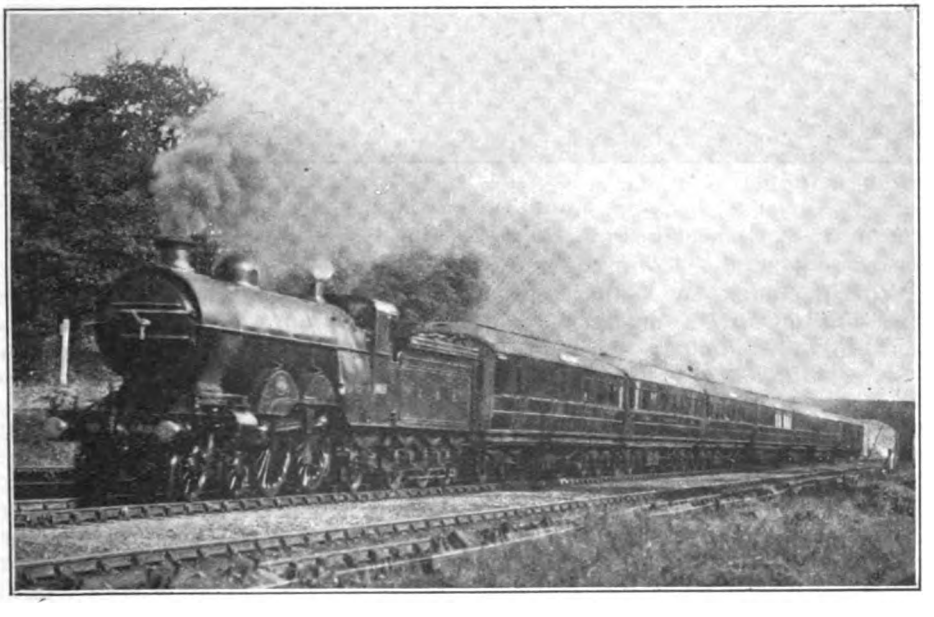

Photo.] GREAT NORTHERN RAILWAY. [*C. Laundy.*

5.30 p.m. Down Newcastle Express. Superheater 4-4-2 engine No. 1405.

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then, after crawling past the station, were brought to a dead stand for over 2 min. at a point 83·1 miles from London. After re-starting we were slightly checked again before Brinklow, and in consequence ran for some distance under very easy steam, but passed Shilton, 8·2 miles, in 13 min. 5 sec., Nuneaton, 14 miles, in 19 min. 5 sec., and Polesworth, 23·4 miles, in 27 min. 40 sec., speed having risen to 69 m.p.h. at both Nuneaton and Polesworth, with an intervening minimum of 64½ at Atherstone. After Polesworth came the new colliery subsidence slack, painfully slow approach. From London we had taken 3 hours 18 min. 40 sec., instead of 200 min., but we stopped only 4 min. at Bletchley instead of the 5 scheduled. With no stop at Bletchley, however, and no delays (other than the inexplicably cautious approaches to Stafford and Crewe, worth together from 2 to 3 min.), I should put the net running times at 71 min. to Blisworth, 91 to Rugby, 109 to Nuneaton, 120½ to Tamworth, 146½ to Stafford, and 177 min. to Crewe. Beyond Crewe, too, after losing our "English Lakes" portion, and attaching

MIDLAND RAILWAY.

St. Pancras–Leicester Express near Mill Hill. 4-4-0 locomotive No. 731.

observed with great rigour, so that we took 32¼ min. to Tamworth, 27 miles; 39¾ min. to Lichfield, 33·2 miles; 49¼ min. to Rugeley, 41·1 miles; and 59 min. 40 sec. to Stafford, 50·5 miles. Trent Valley curve also was traversed with the most exemplary caution, speed being brought down to 34 m.p.h. For all that we passed Stafford only 80 sec. behind time.

The least enterprising work of the whole journey was done beyond Stafford, the 14 miles from Stafford up to Whitmore taking 18 min. 35 sec., while the last 10·5 miles down to Crewe occupied 12¾ min., with a top speed of 69 m.p.h., and another one from the Cambrian line to Manchester (composed of very up-to-date Cambrian stock, and brought into Crewe by a Cambrian engine), No. 1670 did some more good running, as, despite a severe signal check at Chelford, we ran the 25 miles to Stockport, with 320 tons, in 31¼ min. (29 min. net), touching 67 m.p.h. at Cheadle Hulme. On another recent occasion No. 740, of the same type, made the same run in 28¾ min., with 270 tons, touching 71½ m.p.h. Finally, on this run, despite a dead stop for signals at Longsight, not to mention the 16¼ min. we stood at Crewe, we actually ran into

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Manchester 5 minutes early! Allowing, indeed, for a run of 177 min. to Crewe non-stop, as on the winter schedule, a stop of only 5 min. there (engines are not changed at Crewe), 29 min. more on to Stockport, 5 min. there, and finally 9 min. for the run to Manchester, we should, on the basis of our actual running on this occasion, with 405 tons to Crewe and 320 beyond, have completed the journey in 3¾ hours, instead of the agreed competitive *minimum* time of 4½ hours by all trains!

For pure speed, devoid of special merit, a trip I had in the early hours of an August morning was a pleasant experience. The venue was the Midland main line from Ais Gill to Carlisle, and the "sprint" followed a rather indifferent climb from Settle to Blea Moor, behind a 3-cylinder 4-4-0 compound, of all engines; the 11.30 p.m. from St. Pancras was the train, and 185 tons the load. Although we started well from Hellifield by covering the 3¼ miles to Settle Junction in 4¾ min., and passing that point at 65 m.p.h., and got on fairly well as far as Horton (8 miles further in 12 min. 40 sec.), the remainder of the climb got progressively slower and slower, until we passed Blea Moor Box in 30¾ min. from Hellifield, at a speed of just 21 m.p.h. From Blea Moor to Ais Gill we took 15 min. 40 sec., and then, having lost nearly 5½ min. on our 41 min. schedule from Hellifield, we began to make substantial amends. The 6¾ miles from Ais Gill to Kirkby Stephen took 6 min. 25 sec., and from there for some miles the speed ranged from 74 to 77½ m.p.h.; from Kirkby Stephen to Appleby, where the short 1 in 183 up reduced the rate to 60 m.p.h., the time taken for the 10¾ miles was exactly 9¼ min. From Appleby to Culgaith, 7½ miles, took 6 min. 40 sec., and from there to Lazonby, 7¾ miles, 7 min. 10 sec.; the subsequent 1¾ miles up at 1 in 165 reduced the rate to 54 m.p.h., but at Cotehill we were up to 72½ again. So we ran the 5½ miles from Lazonby to Armathwaite in 5 min. 20 sec., the 7¾ miles thence to Scotby in 6 min. 35 sec., and finished up over the 2¾ miles into Carlisle in 3 min. 40 sec.—total, 45 min. 5 sec. for the 48¼ miles from Ais Gill (4 min. under schedule) and 91½ min. from Hellifield (1½ min. overtime). From Ais Gill to Scotby we covered 45½ miles in 41 min. 25 sec., at an average of 66 m.p.h.

On the Great Eastern Railway, too, I recently enjoyed a fine run to town from Ipswich, well up to pre-war standards. It was on the 8.3 p.m. from Ipswich to London, before its deceleration on July 12 last from 86 to 89 min. Superheated 4-6-0 No. 1530 was the engine, and 270 tons the gross load, made up of nine corridor 8-wheelers, including restaurant cars, and a 6-wheeler. Breasting the 1 in 120-130 to Belstead at a minimum of 29 m.p.h., we passed the box, 3·5 miles, in 8 min. 10 sec., and Manningtree, 9·2 miles, in 14 min. 35 sec., at 66 m.p.h. On Ardleigh bank (2½ miles at 1 in 134), we did not fall below 42 m.p.h., and touching 64½ m.p.h. before Colchester, we passed the latter station (17 miles), at a carefully reduced speed of 45 m.p.h., in 23½ min. Rapidly regaining speed, we went up Lexden bank (1⅜ miles at 1 in 165–128) at a lowest rate of 42 m.p.h., the 5 miles from Colchester to Mark's Tey taking 6 min. 20 sec.; then the 8 miles on to Witham, passed at 64½ m.p.h., were run in 8 min. 20 sec.; and the 8·9 miles thence to Chelmsford in 9¼ min. Slacking slightly through the station here we covered the 9·5 miles of rising grades to Shenfield in 11 min. 55 sec., and the speed at Ingrave, after the concluding 2 miles of the ascent, at 1 in 110–135, was exactly 40 m.p.h.; Ingrave Box, 49·4 miles from the start, was passed in 60 min. 40 sec. Unfortunately we were checked in the descent of Brentwood bank, not getting above 67 m.p.h., and there then followed a very bad p.w.r. check beyond Romford; so the 6·9 miles from Ingrave to Romford occupied 7 min. 5 sec., the 8.4 miles thence to Stratford 10¾ min., and the last 4 tortuous miles into the terminus 7¾ min—total 86¼ min. for the 68·7 miles from Ipswich. But the net time did not exceed 83 min., and was thus a minute inside the best pre-war up schedule.

A correspondent's Great Central run on the 3.31 p.m. Great Central Sunday express from Leicester to London, *via* Wycombe, was of a similar, although far more meritorious, character. "Atlantic" No. 362 was the engine, and 260 tons the gross weight of a crowded 238-ton train. For the 9·2 miles from Leicester to Ashby (all rising and 5¾ at 1 in 176),

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13 min. 20 sec. was a good start; the next 3·9 miles to Lutterworth, including the last 1¼ miles of the climb, took 4 min. 50 sec., and the 6·8 miles from Lutterworth to Rugby were run in 5 min. 55 sec., with a top speed of 83 m.p.h. Very high speed continued to Braunston, this 4·7 miles taking 3 min. 50 sec., while the 7 miles from Braunston up to Charwelton (6½ continuously at 1 in 176) were run in 7½ min., with a minimum speed of 47 m.p.h. Woodford, 34 miles, was passed in exactly 38 min., and the sharply undulating 9·8 miles on to Brackley occupied 8¾ min. From the latter station on to Calvert the speed never dropped below 72 m.p.h., and twice reached 80, the 4·8 miles from Brackley to Finmere taking 3 min. 45 sec., and the 7·7 miles on to Grendon Underwood Junction, where speed was eased to 60 m.p.h., 6 min. 10 sec. Thus 12·5 miles had been covered in 9 min. 55 sec., at an average of 75·6 m.p.h. The 5·9 miles between Grendon and Ashendon Junctions were covered in 6 min. 10 sec., the 9·4 miles on to Princes Risborough in 9 min. 10 sec., and the 3·2 miles thence to Saunderton in 3 min. 40 sec., the minimum speed up 3¾ miles at 1 in 176–200 and 2¼ at 1 in 167 being the notable one of 50 m.p.h. The final 4·9 miles from Saunderton to Wycombe stop, including the usual West Wycombe check, occupied 6 min., so that the full 79·7 miles from Leicester to Wycombe had been completed in the extraordinary time of 81 min. 45 sec., 9¼ min. under schedule, and that with a 260-ton train. For the 58·5 miles from Lutterworth to Risborough, 53 min. 55 sec. was an astounding time; in consideration of road and load, indeed, this was probably the best of all the fine runs described in this article.

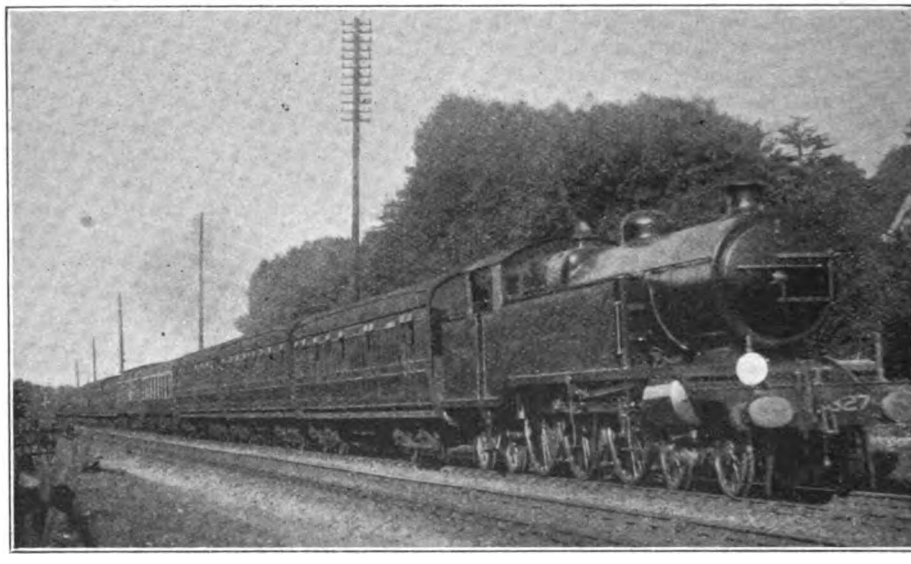

Photo.] LONDON, BRIGHTON & SOUTH COAST RAILWAY [*C. Laundy.*

3.40 p.m. Victoria-Brighton Pullman Car Express. 4-6-4 tank engine No. 327, "Charles C. Macrae."

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The Bridport Railway.

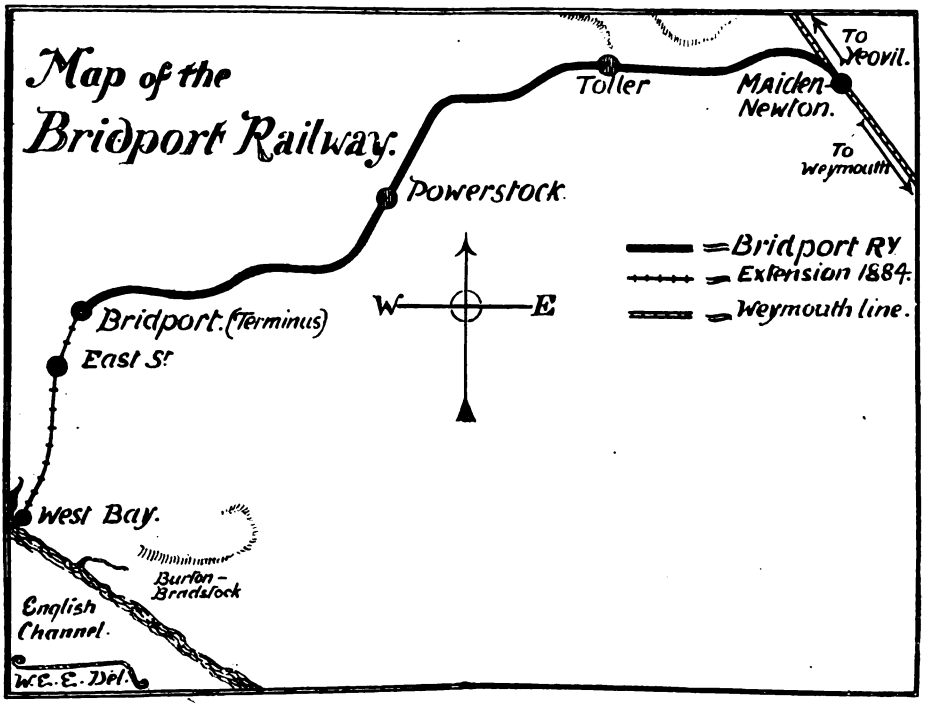
By W. E. EDWARDS.

THE first survey for a railway in the Bridport district was made as early as the year 1843; but in view of the fate of many such enterprises of that period it is not surprising to find that the project, as a contemporary writer expressed it, "fell through for want of cash."

Nevertheless, during the year following, that which is now the Southampton and Dorchester section of the London and South Western Railway was in course of construction, and a scheme for an extension thereof, known as the "Coast Line" was likewise under discussion, by means of which Bridport would be provided with a through station upon the projected route to Exeter *via* Axminster.

Next appeared another scheme, although under similar auspices, known as the "Central" route, whereby Exeter might be reached, as the reader will be aware, by the present and more direct means, *via* Salisbury and Yeovil. Under that project a junction line from Yeovil was at first contemplated, again supplying Bridport with a station, and forming also an alternative route to Exeter.

Yet another proposal should be mentioned, known as the "Devon and Dorset line," in which the Great Western Railway was interested; that provided for a junction (as at present) with the Wilts, Somerset and Weymouth Railway at Maiden-Newton, and so serving Bridport, but having once more Exeter as the objective, thus affording a broad-gauge route upon which Axminster would again be provided with through facilities. The latter scheme was defeated by its opponents; the Coast Line, as readers are aware, never materialised, while the "Central" line awaited completion for a long period, and the interests of Bridport naturally disappeared in the process. Another proposal for the extension of the Bridport



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Railway itself should here be noted, described as the West Dorset Railway, by means of which Charmouth was to be reached; that undertaking being a joint one on the part of the Bridport and Great Western Companies, albeit of later origin, and similarly unsuccessful in result, but having, however, no bearing upon the story at the present stage.

By the year 1851 we find that Bridport had already decided to have "a railway of its own," and, after a public meeting of the townsmen held at that date, practical action speedily followed. After hearing the arguments of Captain Moorson, in advocating the above-mentioned Coast line, an opinion was expressed that "Bridport people could hope for nothing from the South Western (Railway) but the Central line, which shut their town out," whereupon Mr. Flight (afterwards Secretary to the Bridport Railway) urged the town to "trust to itself." As a consequence "merchants and shareholders came forward," and the Bridport Railway Company completed its formation, having Mr. Joseph Gundry as chairman of the board of Directors. Among the expected advantages then indicated was that of "coals coming from Radstock with a decrease in price."

The contractor was Mr. Kenneth Mathieson, and the engineering difficulties, owing to the hilly nature of the country, were of a formidable character, particularly in the case of the Witherstone cutting, between Toller and Powerstock. The latter name is an absurd modern corruption of "Poorstock," although the proper spelling thereof appears in the earlier public notices, &c., of the local railway. No station at Toller, viz., Toller Porcorum, existed for a considerable period after the formation of the line. The original rails were of the type known as McDonnell's patent, the line between Maiden-Newton and Bridport being single throughout, and, of course, of broad gauge dimensions.

On Thursday, November 12, 1857, the Bridport Railway was opened without public ceremonial, but the event was marked by the non-departure on that day of the Taunton coach, hitherto starting from the Bull Hotel, Bridport. The first train arrived at 9 a.m., the locomotive bearing a flag at "each corner," returning again to Maiden-Newton, it is stated, at 9.25 with "directors upon the engine." Upon the following Tuesday, however, Bridport observed a general holiday, with a banquet at the Bull Hotel, at which 140 guests were entertained. Over the chairman (Mr. Joseph Gundry) was suspended a banner, which appropriately bore the motto, "Aide toi et ciel t'aidera." Two divisional superintendents of the Great Western Railway were amongst the visitors, viz., Messrs. T. Graham and W. Tarr, with the following directors: T. A. Mitchell, M.P., T. Luce, M.P., and G. Olgilvy, Esq.; Mr. K. D. Hodgson (Mayor), and the Rector of Bridport were also present.

Mr. Olgilvy replied to the toast: "The Great Western Railway and its Directors and Officers," stating that "they all knew the dividend of the original line was 8 per cent., but from the extensions they also knew what the last dividend was! But he was conscious that generous forbearance would be extended to the directors. The old battle of broad and narrow gauge had been referred to, but he never knew the man who, when the broad gauge was introduced, regretted it! The line was one of the most admirable roads; the design of the great engineer (Brunel) who that day added, he hoped, a crowning triumph in the launching of the ss. *Leviathan*." The navvies, it is related, were entertained by "a treat of beef and plenty of strong beer."

The original time-table, dated November 12, 1857, which appeared under the heading: "Bridport Railway.—Time Bill," announced the departures as follows: 8.15, 9.25, 12.45, 3.50, 6.15; the passengers arriving at Paddington respectively at 4.55, 3.50, 6 and 10.35 p.m. All trains were first and second-class only, saving the 8.15 a.m., which conveyed third-class passengers, reaching London as noted, as late as 4.55 p.m. There were no Sunday trains, and it will be observed that, after 3.50 p.m., no service to Paddington existed.

From the outset the traffic, as such, was of a satisfactory nature, especially as to merchandise, but ere a twelvemonth difficulties arose between the owning and working companies with regard to maintenance and from other causes. A serious slip had occurred at Witherstone, and the original metals, it was discovered, were

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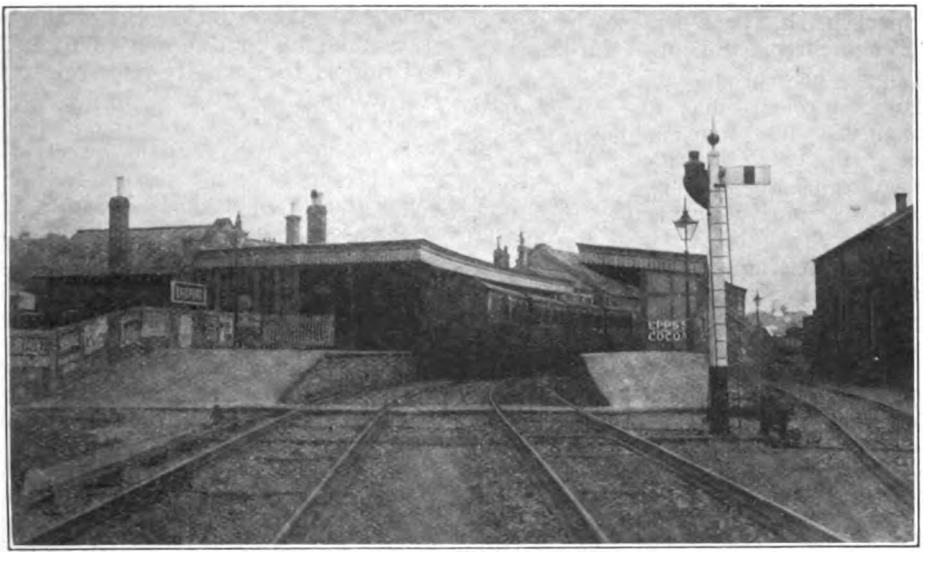
too light in character. Drainage work was also required. We thus find that in the autumn of 1858 an offer was made to the Paddington authorities to lease the line for 21 years, sharing half of the profits, whilst the Bridport directors would contribute £4,000 towards the works above noted, but it appears that a further 5 per cent. of the proceeds was demanded by the Great Western Railway.

By February, 1859, an agreement was formulated whereby the undertaking would be leased as from July 1, 1858, for the period above stated, under which terms the Great Western Railway were to be entitled to 52½ per cent. of the receipts, the Bridport Company paying taxes and tithes. The latter further agreed to completely repair the permanent way, including the Witherstone operations, after which the maintenance would pass over to the Great Western Railway. It is worth noticing that no less than 20,000 cubic yards of spoil earth, resultant of the slip in question, required removal, but a fortunate discovery revealed the fact that the spoil was of a composition eminently suitable for brick-making, and as such, could be disposed of even at a profit!

A remarkable happening of early days should not pass unnoticed in that an execution against the Bridport Railway was applied for, and granted in April, 1859, on behalf of the contractor, although likewise a shareholder. The jury found that the company, as owner, was possessed of certain chattels, amongst them being the rails laid down as far as Maiden-Newton valued at £2,000, and that the said company also owned the land upon which they were laid. Readers acquainted with the construction of broad-gauge permanent way will appreciate the contention of the plaintiff that the rails were "removeables," in that they, as well as the timber frame-work, "could be lifted and carried away!" However, it appears that the Great Western interests could not be disregarded, and apparently nothing further resulted, as it eventually transpired that the chattels consisted merely of a copying-press, waiting-room furniture, and two clocks, the one belonging to Bridport, with another at Powerstock, while, even in these cases the actual ownership was not made clear.

After various negotiations and discussions extending over long periods touching the future of the line, including the somewhat impracticable suggestion by a shareholder that offers might be made to the Midland Railway, the undertaking



BRIDPORT STATION, THE FORMER TERMINUS.

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became in 1900* a branch of the Great Western Railway, and as such it testifies to-day to the early enterprise of the town of Bridport in providing "a railway of its own."

The mileage between Maiden-Newton and the original terminus at Bridport is 9 miles 21 chains, which, together with the West Bay extension, also locally promoted, opened in March, 1884, makes a total of 11 miles 18 chains. The scheme included a second station in East Street, Bridport. The gauge was converted with the remainder of the Wilts and Somerset section in June, 1874. The geography of the line may be conjectured from the fact that the Bridport shed has been occupied by saddle-tank engines from the outset until now.

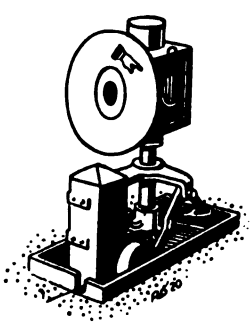
Among the broad-gauge locomotives there stationed, may be mentioned *Theocratus*, of four-coupled, leading bogie type, the driver of whom was Greenaway, afterwards a well known locomotive inspector. Another broad-gauge notability, who finished a long career at Bridport, was Driver Taylor, a *protégé* of Sir Daniel Gooch, and originally a north country miner, who drove, in January, 1857, the first train from Weymouth to Chippenham. Neither should Guard Sheppard be omitted, who served under both gauges, and whose duty it was (until late in the 'seventies) to apply the hand-brake of each passenger train on arrival at Bridport to avoid collisions with the buffer stops. There was then no "running round road" for the engine, and the coaches were drawn up by horses.

On leaving Maiden-Newton there is a fall of 1 in 100 for about 400 yards, followed by a longer declivity of 1 in 190, while next an ascent at 1 in 150 brings us to Toller Station (serving the village of Toller Fratrum as well as Toller Porcorum), the gradient continuing at 130 and 85 respectively, followed by a stiff bank of 1 mile 31 chains at 1 in 50, falling in the opposite direction, this easing down to 75 outside Powerstock. Below the latter station the fall continues at 52, 62 and 130 to Bridport, the declivity extending to West Bay at 80 at the steepest, broken by one ascent of 18 chains at the same incline.

There are stop-boards between Toller and Powerstock, as also at 3½ chains below the latter station. Bridport is the crossing station, electrical train staff working being in force throughout.

It may be noted that the junction at Maiden-Newton is in the down direction, and until recently a shuttle service has existed from the outset. It is of interest to remember, however, that in the broad-gauge days the Bridport train made a through trip to Weymouth on Sundays, and the practice continued until the advent of the Weymouth rail motor car service.

* The terms were £6 for each ordinary £10 share; Preference Shares to be paid in full.



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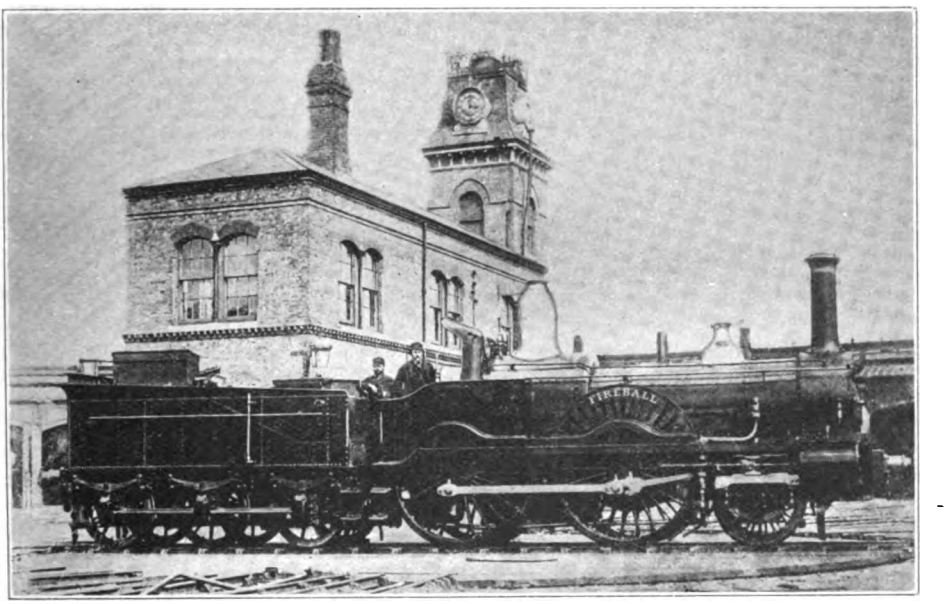
Locomotive and Train Working in the latter part of the 19th Century.

THE LONDON & SOUTH WESTERN RAILWAY. [No. 1.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THE London and South Western main lines may be divided into two sections, the Southern from London to Southampton and Dorchester, and the Western from London to Exeter and Plymouth. Both sections have completed to Exeter in 1860. The North Devon line, opened in 1854, was taken over about 1863. Bournemouth seems to have been a much more modern innovation, the lines from Ringwood and Wimborne dating only from 1870 and 1874



2-4-0 LOCOMOTIVE, No. 73, "FIREBALL."

Designed by Mr. Joseph Beattie and built at Nine Elms, 1864. Cylinders, 17 in. by 22 in. Coupled wheels, 7 ft. diam.

the first 51 miles from London in common, and bifurcate at Worting Junction, some 3 miles beyond Basingstoke, where the older London and Southampton Railway bears away in a south-westerly direction. This line dates back to 1838-1840 between London and Southampton, and the continuation to Dorchester was opened about 1847. From Basingstoke the Western line to Andover was opened in 1854, thence to Salisbury in 1857, and was respectively, while the new direct line was not opened until 1888. One other section might also be considered almost as a main line, viz., the Portsmouth direct line, over which through trains ran in 1859.

The gradients for 20½ miles from Waterloo are easy, then for 9½ miles there is a steady rise, beginning at 1 in 388, and ending in 3 miles of 1 in 314. Thence to the 46th post the gradients are somewhat more easy, though there is a gradual

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rise almost the whole way. From the 46th post to the 52nd post on the Southampton line, there is a steady pull of 1 in 249. The summit at Litchfield tunnel is 55¼ miles from London, whence there is a steady descent, which may be said to average about 1 in 240 to 1 in 250 to the 72nd post, after which the fall to Southampton—79 miles—is more gentle.

The Western section from Basingstoke to Exeter is an exceedingly difficult piece of road for locomotives. From the junction (51 miles) to Andover (66 miles) there is practically a continuous fall, the last 3 miles of which are at 1 in 178, thence the line rises to beyond the 73rd post, the steepest being 3 miles of 1 in 165, after which there is a fall of more than 10 miles to Salisbury, of which 4 are at 1 in 140 to 1 in 169. From Salisbury there is a steady pull up to Semley near the 101st post, after which there is a steep descent of 4 miles of 1 in 100 to 1 in 130, then a fairly stiff rise to the 107½ post, followed by another steep fall of 1 in 100 for 2 miles and a rise of 1 in 80 for nearly 1 mile to Templecombe Station. Many trains stop at this important junction, and on re-starting have to do so on a rising gradient of 1 in 100 which extends for 1½ miles to the 113½ post, whence there is a steady fall to Yeovil Junction, a short section of which is at 1 in 80. Then follows a stiff pull of 4 miles at 1 in 140 to 1 in 200, and another fall to the 130½ post, after which the very stiff Crewkerne rise—3 miles of 1 in 80—has to be negotiated. For the next 12½ miles to the 146th post is a fairly steep downhill grade varying from 1 in 120 to 1 in 225, after which comes the hardest climb of all for 8½ miles, much of which is at 1 in 70 and 1 in 80, followed by a fall of 13½ miles mostly at 1 in 100 (with a few steeper stretches of 1 in 80 and 1 in 90), and a final rise to Exeter, 171¼ miles.

The severe gradients west of Salisbury naturally had some effect on the types of locomotives, and from the opening of the Salisbury-Exeter section, the engines specially designed for it have almost throughout South Western history been provided with driving wheels at least 6 in. smaller than those employed between London and Salisbury.

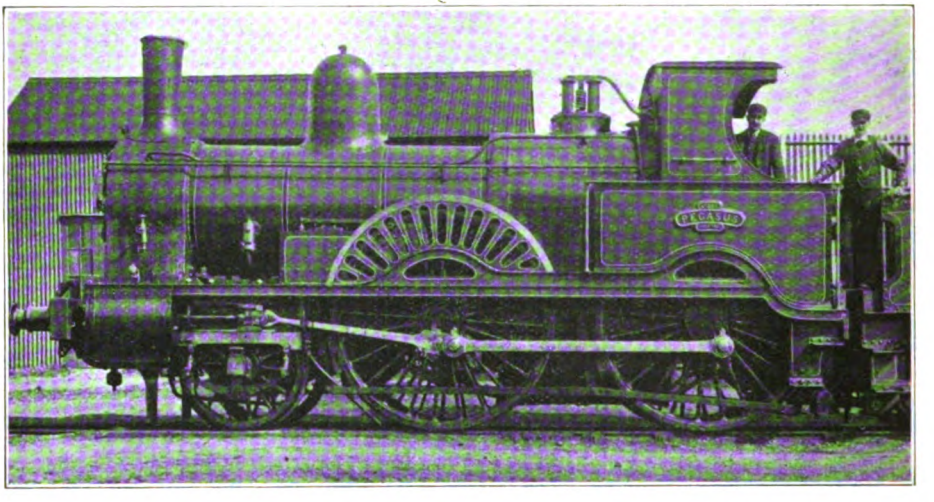

Photo. by [*Locomotive Publishing Co., Ltd.*

2-4-0 ENGINE, No. 97, "PEGASUS," AS REBUILT.
Cylinders 17 in. by 22 in. Coupled wheels, 7 ft. diam.

In 1874, the best down train was the 2.10 p.m. from Waterloo, and at one time this was frequently referred to as the "Beeswing," probably in honour of an old-time racehorse. It was usually "double headed," the train engine being one of the Beattie 7 ft. or 6 ft. 6 in. coupled engines belonging to Nine Elms, and the leading or pilot engine a 7 ft. coupled engine from Southampton shed. In reality the 2.10 was a double train, the first or main portion of which ran to Exeter. The rear portion was detached at Basingstoke and was taken on by the

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Southampton engine, having Weymouth as its ultimate objective. The timing of this train was as follows :—

Miles.			Speed m.p.h.
	Waterloo	dep. 2.10 p.m.	
47¾	Basingstoke ..	arr. 3.17 p.m.	42·75
		dep. 3.20 p.m.	
83½	Salisbury	arr. 4.10 p.m.	42·9
		dep. 4.17 p.m.	
122¾	Yeovil	arr. 5.19 p.m.	38·0
		dep. 5.25 p.m.	
171½	Exeter	arr. 6.25 p.m.	48·75

The last portion of this run was excellent considering the heavy gradients between Yeovil and Exeter, and as there was a ticket platform at Exeter at 171¼ miles, at which I believe the train was due to arrive at 6.23, the average speed would have been over 50 m.p.h.

The Weymouth portion, after leaving Basingstoke, had by no means such a good record, for it took about 55 min. for the 31½ miles thence to Southampton, with one stop at Winchester. After leaving Southampton a complete dry-rot set in, and with a considerable number of stops Weymouth was finally reached at 6.25 p.m.

The only other down express to Exeter worth mentioning was the 10.45 a.m. from Waterloo, which reached Exeter at 3.43 p.m. It was not nearly so good a train as the 2.10, and was allowed 75 min. to Basingstoke, with a conditional stop at Surbiton.

The best up Exeter express was timed as follows :—

Miles.			Speed m.p.h.
	Exeter	dep. 10.10 a.m.	
48¼	Yeovil	arr. 11.17 a.m.	43·7
		dep. 11.22 a.m.	
88	Salisbury	arr. 12.18 p.m.	42·0
		dep. 12.25 p.m.	
123¼	Basingstoke ..	arr. 1.16 p.m.	42·0
		dep. 1.18 p.m.	
170¼	Vauxhall	arr. 2.22 p.m.	43·6

No other up train ran from Exeter to Vauxhall in less than 5 hours 14 min. The best up expresses from Weymouth were the 10.20 a.m., which reached Vauxhall in 4 hours 2 min., and the 6.25 a.m., which took 4 hours 22 min. for the same distance.

By July, 1880, a certain amount of smartening up had taken place. The old 2.10 p.m. down express now left at 2.20, and was timed to Basingstoke (due 3.25 p.m.) in 65 min., at an average speed of 44.1 m.p.h. Leaving Basingstoke at 3.27, it arrived at Salisbury at 4.16 p.m., the running being at the rate of 43¾ m.p.h. The run thence to Exeter took 2 hours 2 min., with two stops at Sherborne and Yeovil Junction, and also the ticket platform stop at Exeter. The train reached Exeter station at 6.24 p.m., an improvement of 11 min. over the 2.10 p.m. running of 1874. Mr. Adams's 4-4-0 bogie engines were used in this year for the first time on these trains. The Weymouth trains had also been improved, the best being the 2.10 p.m. down, which had been separated from the "Exeter express," and now formed an independent train throughout. This ran to Southampton in 2 hours 1 min., with one stop of 3 min. at Basingstoke, and eventually reached Weymouth at 6.4 p.m. But the best South Western locomotive performance of 1880 was made by the 10.15 a.m. up Weymouth express, which left Basingstoke at 1.15 p.m. and ran thence to Vauxhall in 56 min., a running average of 49¾ m.p.h.

Nevertheless, I am afraid the old "Bradshaws" were somewhat misleading and contained within their pages a good deal of fiction. When turning to the times of the up Exeter expresses, there is shown another train due to leave Basingstoke at 1.15 p.m., or at the same time as the above-mentioned up Weymouth express. Moreover, the up Exeter express was due at Vauxhall at 2.21 p.m., with a stop at Surbiton. Apparently there were two trains due to leave Basingstoke at 1.15 p.m., one of which ran non-stop to Vauxhall. In those days there was only one up road, and Basingstoke was a somewhat disreputable* building with one up platform. How they worked those two 1.15 up trains I don't know, and I leave it to my readers to solve the conundrum.

The most celebrated of the old express engines were the 2-4-0 engines of Mr. Joseph Beattie's design, with 7 ft. coupled wheels and outside cylinders, 17 in. by 22 in. Of these, there were 13 in all, and they were the first standard gauge coupled engines to be built with wheels of such large size, although they had been

*The Great Western men used to refer to the South Western at Basingstoke as "Blaze and Smoke."

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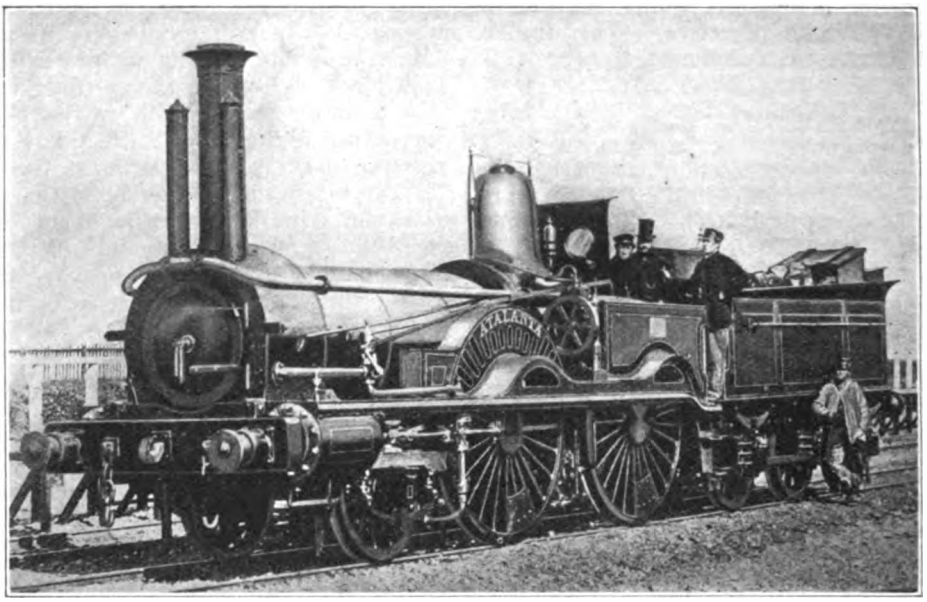

2-4-0 ENGINE "ATALANTA," No. 167.

Cylinders, 17 in. by 22 in. Coupled wheels, 6 ft. 6 in. diam. Fitted with Mr. J. Beattie's combustion chamber and feed-water heater.

preceded by 10 broad gauge four-coupled engines with wheels of the same diameter on the Great Western Railway. The first four of the South Western 7 ft. engines were built at Nine Elms works in 1859, viz., 157 *Clyde*, 158 *Lacy*, 159 *Castleman*, and 169 *R. H. Dutton*, and were followed in 1864 by three almost similar engines 73 *Fireball*, 74 *Firebrand*, and 75 *Fireking*. They were, of course, fitted with Joseph Beattie's patent feed water heating apparatus, to be mentioned later, and with patent fireboxes with combustion chambers. The last six engines, which came out in 1868, were of the same general dimensions, but differed in certain details from the earlier ones. These were 95 *Centaur*, 96 *Castor*, 97 *Pegasus*, 98 *Plutus*, 99 *Phlegon*, and 100 *Python*, and were always stated to be Mr. Joseph Beattie's favourite express engines. The total heating surface of the earlier engines was 1,149 sq. ft., and the weight in working order varied from 33 tons in the "Clyde" class to 36 tons in the later engines. A peculiarity for a fast express engine, was that the wheel base was only 14 ft. 2½ in., the leading wheels being placed rather far back, and only 6 ft. 2½ in. from the centre of the driving wheels. It cannot, however, be said that they were very unsteady engines, and the weight was very evenly divided between the three axles. The pressure was 130 lbs. per sq. in.

For many years these engines were stationed at Nine Elms and worked the fastest trains between London and Salisbury. In the later 'seventies the earlier engines of the class were replaced on the Salisbury trains by the 6 ft. 6 in. coupled engines, but continued to work expresses between London and Southampton. Afterwards Nos. 73 to 75, 157 to 159, and 169 were transferred to Northam (Southampton) shed for this purpose, and at a later date 169 finished its career on the Salisbury and Portsmouth cross-country service. The six engines, 95 to 100, remained at Nine Elms for some time after the others, but were eventually transferred by Mr. Adams to Northam and Dorchester, and during the later 'eighties and early 'nineties worked many of the best trains between Weymouth and Southampton. They were finally broken up between 1894 and 1899, after each of them had covered about a million miles. Four of them had been re-boilered

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between 1887 and 1890 with boilers which had been removed from some of Beyer Peacock's goods engines of 1872-3.

Before leaving the 95 or "Castor" class as they were frequently called, it is not generally known that some of them were in the early 'seventies fitted with piston valves. The economics of locomotive design as practised by Mr. Joseph Beattie, and by his son, Mr. W. G. Beattie, who succeeded him, comprised everything that in any way helped to reduce the coal bill. Whilst Mr. Joseph Beattie devoted most of his attention to fireboxes, combustion chambers, and the well-known systems of feed water heating apparatus, Mr. W. G. Beattie was always trying to improve the valves, and produced one of the best and earliest of the balanced slide valves used in this country. When they first appeared in 1868, the 95 class were fitted with these valves, like most of the subsequent engines on the line. In cross section the valve was semi-circular in shape, and was enclosed in a similarly-shaped casing or jacket inside the steam chest, the casing and valve being made concentric. Grooves were made at each end and on the top of the valve, into which packing rings were fitted, the latter being pressed outwards on to the semi-circular casing by spiral springs.

With a view to an early cut-off of the steam the lap of the valves was no less than 1½ in., possibly the longest ever used in this country. I have always heard that Mr. W. G. Beattie's valves gave good results, but Mr. Adams evidently did not approve of the long lap and reduced this to about 1 in.

Not satisfied with balanced slide valves as a final solution of the valve problem, Mr. W. G. Beattie turned his attention to piston valves, and in the early 'seventies fitted some of these to the 95 class. It can hardly be said that his piston valves were so successful as his balanced slide valves, and those engines which had them would not run downhill without steam, and when running into a station steam had to be kept on until the engine had almost reached the platform. They had other faults, one of which was that the water was trapped in the cylinders, and moreover, the valves seized and a few valve spindles were bent in consequence.

The most numerous class of 2-4-0 express engines was that with 6 ft. 6 in. wheels, and 17 in. by 22 in. cylinders. The first 12 of these came out in 1859-60, and were followed by 31 more of the class built between 1863 and 1871, all designed by Mr. Joseph Beattie. Nineteen similar engines of the same general dimensions were built in 1873-1875 under Mr. W. G. Beattie's superintendency, which differed from the previous engines

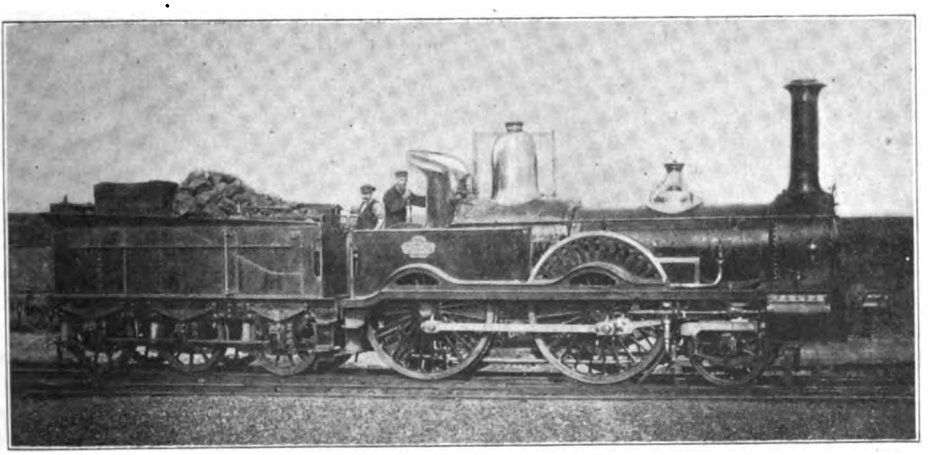

Photo. by] [*Locomotive Publishing Co., Ltd.*

2-4-0 ENGINE "LOCKE" No. 4.

Cylinders, 17 in. by 22 in. Coupled wheels, 6 ft. 6 in. diam.

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in the outward appearance of the splashers, which were enclosed in a long combined sidesheet. These 62 engines performed the bulk of the South Western express work between London and Salisbury and London and Weymouth, and were frequently to be seen even on the severe Salisbury-Exeter road. They also worked regularly on the Reading and Windsor lines.

Those used on the Salisbury expresses were the later ones of the class such as 119, 121 and 122, built in 1869, and also Mr. W. G. Beattie's engines of 1873-1875, Nos. 37, 39-43, 279-281, 294-297 and 315-317. No. 280 was named *Persia* in honour of the Shah, who paid a visit to

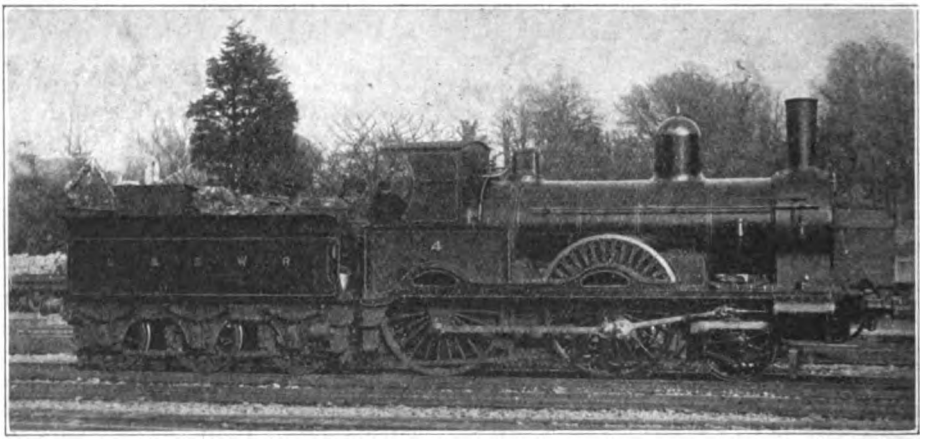

Photo. by] [*Locomotive Publishing Co., Ltd.*

2-4-0 ENGINE, No. 4, AS REBUILT.

Cylinders, 17 in. by 22 in. Coupled wheels, 6 ft. 6 in. diam.

this country and sampled the South Western during the process. The express engines were nearly all stabled at Nine Elms, only one or two being at Salisbury for the early morning up trains to London. Included in the work of the London engines was the crack 2.10 p.m. down Exeter express, which, as already mentioned, was at one time known as the "Beeswing." The 7 ft. coupled engines also took their turns on this train, though I think that the 6 ft. 6 in. engines were more often to be seen working it. No. 121 was the celebrated *St. George*, which tried conclusions with the South Eastern Cudworth singles on the Cannon Street and Dover boat trains.

When continuous brakes were being tried on most British lines, No. 1 *Sussex* of this class was fitted with the automatic vacuum brake, whilst No. 2 *Tartar* was provided with the Westinghouse brake. These were at Nine Elms, and for some time ran between London and Portsmouth. *Herod*, No. 81, also had the Westinghouse brake. In 1887 I used to see No. 2 *Tartar* on main line slow trains to Salisbury.

Of the other engines, Nos. 4, 6, 79 to 88, &c., were mostly at Nine Elms on Waterloo and Southampton trains, whilst the oldest of the class, Nos. 163 to 168 and 170 to 175 were mostly at Northam (Southampton) and Dorchester, and ran between Southampton and Weymouth

When these last mentioned engines were broken up in 1885-6, their places on the Weymouth trains were taken by several of the later engines of the same class which had come off the Salisbury road.

Mr. Adams rebuilt 14 of these engines in 1885 to 1888, with boilers having a more modern appearance, round topped domes, Ramsbottom safety valves over the fireboxes, and cabs, after which they did useful work mostly on the Weymouth section, though I occasionally used to see them at Exeter.

Finally, there was one other 6 ft. 6 in. coupled engine, the *Ironsides*, No. 134, which dated back to 1855, when it had been built at Nine Elms as a single engine. Subsequently, it was converted to a

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coupled engine with the peculiarity that the eccentrics and valve motion were outside, thus giving it the appearance of a Continental engine. I believe in its converted condition the cylinders were 16 in. by 22 in., and it was to be found on the Portsmouth line at one time, but its usual habitat was Woking, whence it worked regularly to Waterloo. This peculiar engine disappeared in 1885.

(To be continued.)

WITH THE PRINCE OF WALES IN NEW SOUTH WALES.

We are indebted to Mr. C. F. Dewey for an interesting series of photographs, one of which is reproduced, dealing with the journeys of H.R.H. The Prince of Wales on the New South Wales Government Railways. The train usually consisted of eight bogie cars representing some of the finest rolling-stock in the State. The car set apart for His Royal Highness was that usually made use of by the Governor-General and was built some years ago; but for this occasion it was most luxuriously equipped and lavishly decorated and fitted with electric radiators, fans and lights throughout. Shower baths were provided, and in fact nothing that would help to make the train journey most enjoyable was overlooked.

The traffic arrangements made for the safe passage of the royal train were similar to those adopted by the English lines, pilot and emergency engines being provided, and on account of the many different loading limits on the various routes over which the royal party travelled several different types of locomotives were specially decorated.

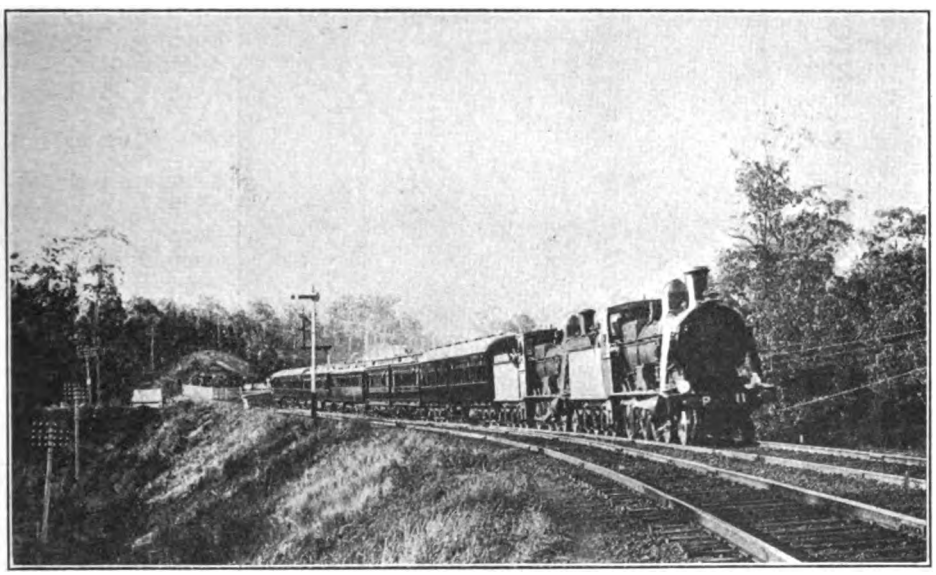

Photo.] NEW SOUTH WALES GOVERNMENT RAILWAYS. [*C. F. Dewey.*

H.R.H The Prince of Wales' Royal train at Fassifern, Northern Line. Drawn by two "P" class superheater 4-6-0 locomotives.

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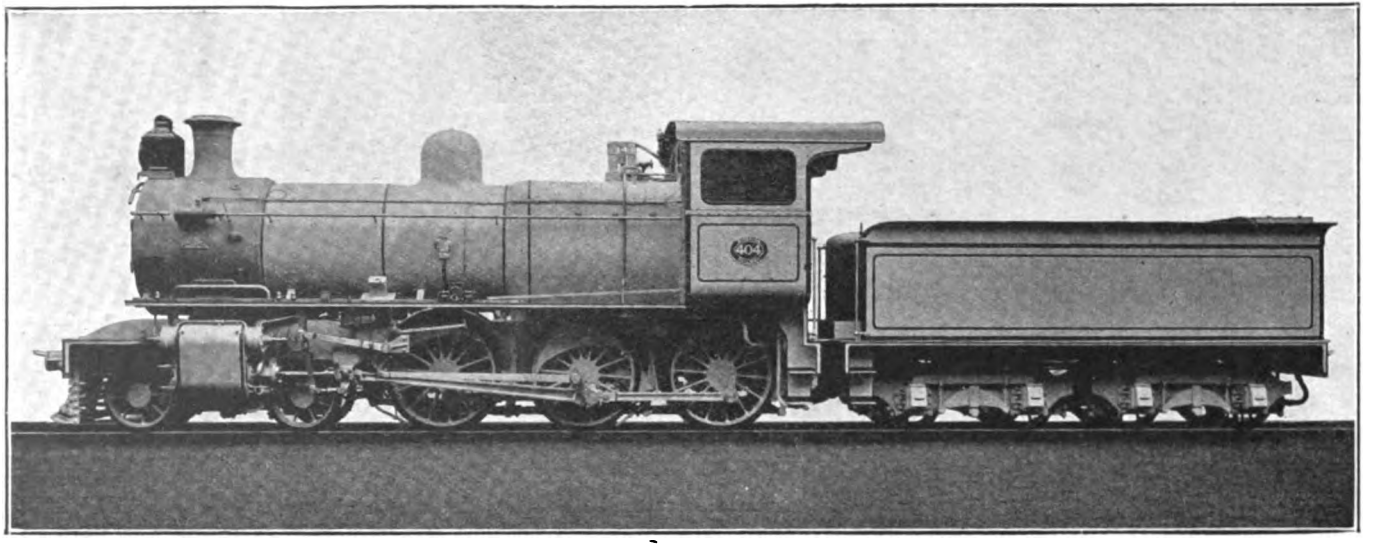
NEW 4-6-0 LOCOMOTIVES, NIGERIAN RAILWAY.



BUILT by Nasmyth, Wilson & Co., these engines are fitted with superheating apparatus, Wakefield mechanical lubricator, Walschaert valve gear and other features associated with modern practice. Gauge is 3 ft. 6 in., cylinders 18 in. by 22 in., coupled wheels 4 ft. 6 in diam., heating surface 1,206 sq. ft., grate area 17·8 sq. ft., steam pressure 160 lb. per sq. in., and weight in working—engine, 47 tons 13 cwt.; tender, 30 tons 6 cwt.

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Round the London Termini.

By BASIL MERCER.

IT is a curious thing that, while many of our large stations have been placed under the direct patronage of some saint, terminal stations in general are under the protection of one of the oldest pagan divinities of Ancient Rome. The God Terminus, who was first recognised as an institution by Numa Pompilius, second legendary king of Rome, was worshipped as the guardian of boundaries and frontiers; in the sense that a terminal station marks the end of a railway company's territory, we may assume that the worship of the old Roman divinity has survived to this day. The saints, however, are not neglected; there is a quite long list of those members of the hagiocracy who have given their names and patronage to railway stations.

Great Western Railway.

Many suggestions come to mind when approaching Paddington. The name itself is very ancient and supposed to be derived from a corruption of Baynard's Town, as the manor was once the property of the owner of Baynard's Tower. More modern recollections inside those of "Pretty Polly Perkins of Paddington Green," and of Mrs. Siddons. Brunel's design for the station is reminiscent of the Regency period, for there is marked resemblance to the famous Pavilion at Brighton. It is worthy of note that this architectural style has been preserved in the recent additions to the Great Western terminus. Even now, the station preserves an early nineteenth century aspect, although the owning company is more than sympathetic with modern progress.

Situated in the extreme west of London, Paddington station has a westerly direction and lies towards the setting sun, and the Great Western system covers most of the west of England; one sometimes feels that Hesperia would be a not unsuitable name. There is also an early Victorian memory, for the first royal railway journey took place on this system and into Paddington station, when the Prince Consort remarked, after alighting from the train, "Not quite so fast next time, Mr. Conductor, please!" I wonder what he would have thought nowadays, for the Great Western was a line famous for record runs in the years immediately preceding the war, and even now is by no means sluggish. Paddington is mentioned in many books; it figures as the starting place of that terrible chase in "Dead Man's Rock," and it has a place in a large number of other novels. The appearance of the interior will long survive in the late Mr. W. P. Frith's celebrated picture, "The Railway Station."

London & South Western Railway.

The London and South Western terminus takes its name from Waterloo Bridge, and so indirectly from the great battle of 1815. It is reminiscent of wars and rumours of wars, for at no other London station are so many sailors and soldiers seen. The naval element is particularly strong; this is not surprising when we recollect that three of the most important naval depôts, Portsmouth, Devonport and Portland, are on this company's system. It is equally easy to account for the presence of the military, for the Aldershot Command spreads its enormous extent over a district intersected with South Western lines only 30 miles from town.

Waterloo, now the largest station in London, will be one of the finest when completed. The commodious circulating area is of great benefit at crowded hours and forms a fine "pleasaunce." The new circular refreshment room makes appeal to the artistic and physical senses; the historical interest is studied by the preservation of two of the old coaches of the Bodmin and Wadebridge Railway. When the alterations are complete, all the 23 platform entrances will be in line,

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an effect pleasing both to the eye and for traffic-working. The old terminus was in many ways curious and was the source of much humour for the comic writers. Mr. Jerome K. Jerome's skit upon Waterloo and its ways in "Three Men in a Boat" will be remembered sympathetically both by the railway officials and the travelling public. *Punch* poked fun at the somewhat heterogeneous collection of roofs and platforms which formed the old station: the *Entente Cordiale* with France had just been proclaimed when Mr. Punch announced that England, as a token of respect and esteem, was going to present Waterloo Station (as it then was) to the French Government, who were going to erect it in the Champs Elysées. But all these things are changed, and the North, Central, and South stations of Waterloo are mere memories, "unwept, unhonoured and unsung."

London, Brighton & South Coast.

At first sight the possession of both West End and City termini may seem to be a great advantage to the owning railway company, but the traffic officers do not consider such an arrangement an altogether unmixed blessing. It entails the provision of two portions on many trains from and to the more important stations, and the division or joining of these portions somewhere *en route*. The London, Brighton and South Coast Railway rejoices in two terminal stations: London Bridge, where are situated the general offices of the company, is on the south side of the river, and deals with the City traffic; Victoria, enlarged, altered and improved out of all recognition in the last decade, serves the more aristocratic district of Belgravia. It must not be supposed that Victoria deals solely with a pleasure traffic. One is apt, sometimes, to think of this rejuvenated terminus as the home of Southern Belles and Pullman Limiteds, forgetting that a large business quarter, occupied largely by the engineering fraternity, has grown up between Pimlico and the Houses of Parliament at Westminster. Then there is the Continental route via Newhaven and Dieppe, and an important route to Portsmouth.

South Eastern & Chatham.

Citizens of London may well exclaim with Sir Walter Scott (in "St. Ronan's Well"):—

"There must be government in all society:
"Bees have their queen, and stag herds have their leader:
"Rome had her consuls, Athens had her archons,
'But we, Sir, have our managing committee."

The Managing Committee of the South Eastern and Chatham Railway is very much with us in the matter of termini; when the amalgamation was first mooted, irreverent people called the two companies "the little body with the big head," on account of the number of London terminals used by the two railways. The South Eastern gave three: Charing Cross, Cannon Street and London Bridge, the latter ranking as a first-class or principal station though not a terminus. The Chatham Railway contributed four: Victoria, Holborn Viaduct, Ludgate Hill and St. Paul's. The third-named of this group has been dispossessed of its high estate; it has lost two of its four platforms, and ceases to do main line business. Like London Bridge (South Eastern), it was mainly a through station, but its near neighbour, St. Paul's, was a hybrid, being partly terminal and partly through.

None of these stations was very big, Cannon Street with nine platforms being top-weight. Needless to add, when the joint companies proposed to economise by closing some of their termini, a storm of indignation arose; some elderly and portly citizens were fearful lest they should have to commit the unusual exercise of walking half a mile instead of a few yards. Such an agglomeration of stations may have been very nice for the suburban public, but they were anything but a desirable feature in the equipment of a railway; diffusion of strength is never desirable in any walk of life.

With the exception of Victoria all these stations are placed on what the popular press, in its curious English calls "very" historical ground: almost every yard traversed by the City lines of the Managing Committee is celebrated in song and story. We may call to mind London Stone in Cannon Street, the Cross of Charing, the Tabard Inn of Southwark, and many other old associations, not

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given a thought by the great majority of the season-ticket holders who use each of these stations in large numbers every working day of the week. Victoria, as befits its somewhat newer locality, presents us with a fine façade in the modern French style, reminiscent of the chateau of some rich French bourgeois or noble of the Empire.

This suggestion of Continental architecture is most appropriate for the South Eastern and Chatham, whose services to and from the Continent amounted in pre-war times to 20 trains daily. The whole way through Kent and the sea journey across the straits is rich with memories of England's history. The journey from London to Dover has probably been described more than any other journey in the British Isles, and Charing Cross is dearly beloved as local colour by the novelists. In railway matters you may think of the former competition between the two railways, once as widely separated and bitterly antagonised as they now are happily and successfully united. Pullman's have come to their own again, recalling the once famous " Club Trains " of the last century. Though surrounded by mediæval recollections, there is nothing mediæval about the train services or the rolling-stock which now serve the Garden of England. Quietly and effectively the new has displaced the old in railway methods; the joint companies, having made peace with honour, now give us travel with comfort.

Great Eastern.

It is remarked by those competent to judge that there is no necessity for an intelligent traveller to ask a single question at Liverpool Street. At this great station, with its 18 platforms, crowd-handling has been reduced to a fine art: all information is posted up in easy reach; indicators abound and the most complex main line trains are very thoroughly labelled. The Great Eastern introduced a most admirable system for dealing with luggage in the holiday seasons some years ago. When the passenger arrived at the station, he bought his ticket and saw his belongings labelled; then the company took charge and placed all these classified packages in a baggage room, whence they were taken to the right vans in the trains. The passenger was thus gently but firmly discouraged from forming a procession of himself, his wife and his children, with his luggage on a truck, down the crowded platforms, to the great relief of tempers all round. More important still, this excellent way of working prevented delays.

Like the London and South Western, who moved from Nine Elms to Waterloo, the Great Eastern came inwards from a former terminus at Bishopsgate, now their chief London goods station. Liverpool Street has 18 platforms, being second only to the new Waterloo; in the mornings and evenings, and at the busy holiday times, employment could be found for many more platforms than exist. Traffic may be elastic, but station sites are not; the Great Eastern is rigidly bounded by two important main streets of the City of London and the equally important goods and passenger station at Broad Street; further enlargement, of the kind that took place in 1894, is thus rendered impossible. Fortunately, there are no less than six roads out of the station, the accommodation being proportionately increased. The General Offices, an excellent hotel and refreshment rooms, and tea rooms like the famous Hanging Gardens of Babylon, complete the equipment of this compact and admirably laid-out terminus.

Some relief is afforded to Liverpool Street (or rather *was*, before the war) by running some trains from the Cambridge main line into St. Pancras, which the Great Eastern described as their " West End " terminus. It is not recorded what the unwary passenger who arrived there and took a cab to West Kensington thought and said when he paid the fare. Perhaps he confined himself to the sign language—actions speak louder than words, as T. E. Dunville sings.

More considerable relief was given by the further Great Eastern terminus at Fenchurch Street. This singularly unattractive station also provided accommodation for the trains of the London, Tilbury and Southend Railway (now Midland Railway—Tilbury section), which company had to conduct its entire business at one platform only. Fenchurch Street was the terminus of the London and

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Blackwall line, one of London's earliest railways.

Great Northern.

Croce di Re, as Mr. Barry Pain irreverently termed King's Cross in his amusing dog-Italian, made its bow to the public in October, 1852. The Great Northern had been previously opened to Maiden Lane, where temporary platforms had been erected; from this cheerless locality Queen Victoria and the Prince Consort had departed for Scotland in the previous year. But in very truth, the whole of this part of London was cheerless. The Great Northern cut through a dismal part of the world, sarcastically named Belle Isle, which name is still preserved on one of the main line signal boxes. The district was a refuse heap and a home for odd and disreputable characters; in these parts flourished the industry of turning English wild birds into canaries, by the simple if dishonest process of dyeing them yellow; it was a sort of nineteenth century Alsatia. The first great clearance took place when the Great Northern built their large, though not beautiful terminus. We must not forget, however, that when King's Cross was opened, it was considered a masterpiece of architecture, and the design was distinctly original as far as this country was concerned. The arched roofs, copied from the Imperial Riding School at Moscow, were constructed of girders made of bundles of planks, tied together and overlapping lengthways, so that the effect was that of a huge bow. The forebodings of Mr. Denison, then Chairman, that the side walls adjoining York Road would not stand the strain, were amply justified; the wall could not be buttressed, so the roof had to be rebuilt of iron.

King's Cross presents an impressive appearance, and while there may be doubt about its aesthetic claims, there can be none concerning the value of traffic handled. The London terminus of the East Coast route to Scotland, of the shortest route to the great cities of South Yorkshire, of the lines that serve almost the entire County of Lincoln, and of the suburban trains which climb the "Northern Heights," cannot be ignored from the railway point of view. Both in the past and to-day, the Great Northern has been famed for the speed of its expresses; in the 'eighties this company was "leading the world in speed," nor are its engines anything of laggards to-day—they pull heavier weights, that is all. One curious feature of the station is the somewhat puzzling system adopted for numbering the platforms: on the down or west side, there is an alphabet from A to E; the main line departure and the main line arrival platforms are both "Number One." This duplication is apt to confuse some of the north country men who come up to London in the spring ostensibly to see the Cup Tie. Between the two arches at the south end of the station is a clock tower whose timepiece invariably disagrees with its neighbour of St. Pancras; in this, however, they are true clocks of London which "agree not at all."

London & North Western.

Euston, "the oldest and now one of the largest railway termini in the metropolis" (to quote the RAILWAY YEAR BOOK), lives in dignified seclusion away from the main Euston Road; its three-sided and very comfortable hotel is a further barrier against intrusions on its privacy. Its situation suggests a sort of Sir Roger de Coverley, who lives in the country in a large and imposing mansion some distance from traffic routes, who says that if you want to see him you must come to him; that he is certainly not going to be a modern Muhammad. Apart from the volume of the traffic over the "Royal Mail Route to Scotland and Ireland," and shortest route between London and Liverpool, Manchester, Dublin, and Glasgow, there is much to detain those interested in railways at the London and North Western terminus.

Expanded gradually from the original London and Birmingham station of 1838, bits of which still remain on platforms 6 and 9, Euston has grown into a station with 15 platforms, covering an area of 16 acres. Naturally, the *ensemble* is not exactly homogeneous, and the lay-out seems a little confusing to the passenger visiting the station for the first time. The confusion is more apparent than real, for there are plenty of indicators about and the booking offices are always near the trains. From the traffic point of view,

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though, Euston is admirable: the main line platforms are long and the access is excellent—the Chalk Farm widening of 1902, by which the carriage sidings are reached without fouling the running lines renders the despatch and arrival of main line expresses, one after another, a much more simple matter than at termini lacking this accommodation.

While the railway parts of Euston are almost American in their utilitarian simplicity, there are several really beautiful features about the North Western headquarters. Open to all, yet observed by few, the Grand Hall is the finest railway waiting room in London: it possesses a flat panelled roof, copied from St. Paul's-outside-the-walls at Rome, and is said to be the largest of its kind in the world. Another fine example of this kind of work, though smaller, may be seen at the closely adjacent church of St. Pancras. The Shareholders' Meeting Room and the Board Room are remarkably fine in conception and execution, and take us back to a more dignified, though less hustling, period. The entrance to the station courtyard is imposing, through the famous Doric portico, a decoration which impressed the captious Aubrey Beardsley:—"As for me, I can never understand why people should seek Egypt in search of the Sphinx and the Pyramids, when they can visit Euston station and survey the wonders of the Stone Arch."

An interesting railway memory is aroused in this part of London, for it was at Euston Square in 1802 that Richard Trevithick gave a successful demonstration with his engine, running on a circular track laid for the purpose. There are many other recollections, grave and gay; the corridors leading to the Board Room and other offices are veritable treasure houses of old engravings and mementoes of the early days of railways, and of the time prior to 1850, when Euston was the one and only "Gateway to the North." Most of the waiting and dining rooms have been rebuilt in the last few years, in an artistic though completely modern style; there are no more Egyptian or mediæval ornaments, and the Victorian times have passed with the introduction of bath rooms.

North London Railway.

Broad Street Station, the headquarters of the North London Railway, is singularly compact and well-balanced; it was intended to accommodate purely local traffic for which purpose it seems admirably adapted. Since the Euston firm has entered into a much closer partnership with its small relation, this station may be said to be the City terminus of the North Western, and the "City to City express," between Broad Street and Birmingham, realised this designation. The terminus is on the high level, which enables the trains using it to perform nearly their entire journeys in daylight. The extension from Dalston Junction to the City was an expensive piece of work, but something had to be done to obviate the train service terminating, after a perambulation of the Eastern boundaries, at Fenchurch Street, which, to-day, would be unable to accommodate any more trains.

Midland.

From almost any point of vantage in this neighbourhood the vast roof and graceful towers of St. Pancras show themselves above the surrounding buildings. Though small, compared with some of the great railway stations, this station is one of the ornaments of the metropolis; the perfect gothic curve of Sir Gilbert Scott's hotel and the wonderful roof, 240 ft. in span, the whole elevated above the road level, has a most pleasing effect. The Saint ought to be very grateful in being commemorated by such a magnificent temple.

I mentioned before how the Great Northern made the first reformation of the district; in 1868 the Midland followed suit and swept away the filthy dens of Agar Town and Somer's Town. What is now the Borough of St. Pancras must have been a lively part of the world, with a gas-works, a small-pox hospital, a canal-basin, and a terrible series of mean streets. Mr. F. S. Williams tells us that 3,000 houses and a Church, including a piece of old St. Pancras Churchyard, were transformed into railway property. The dead were re-interred, but, to complicate matters, the relatives of a distinguished French ecclesiastic desired that his remains should be sent to France.

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The grave was opened and the grave-diggers "were surprised to find, not the bones of one man, but of several. Three skulls and three sets of bones were yielded by the soil in which they had lain mouldering. The difficulty was, how to identify the bones of a French ecclesiastic among so many. After much discussion, the shrewdest grave-digger suggested that, being a foreigner, the darkest coloured skull must be his. Acting upon this idea, the blackest bones were sorted and put together, until the requisite number of rights and lefts were obtained. These were reverently screwed up in a new coffin, conveyed to France and buried with all the pomp and circumstance of the Roman Catholic Church."

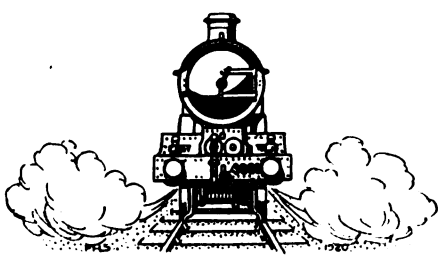
Great Central.

The Great Central terminus, though small, is dealing with an ever-increasing traffic. This is due to two reasons, the first being the development of the London suburban area served by this line. The second is due to the war. In the dark days of the war when trains trailed along at 25 m.p.h. and restaurant cars were not, the Great Central had for a time the quickest train from London to Manchester by five minutes, in spite of its hard road and extra 20 miles of distance. It was possible to get food on the trains, this line being one of the four that preserved this facility all through the war period. As a consequence of this excellent train service, more and more travellers went to the north from Marylebone, in addition to which the pooling of traffic with the Great Northern introduced a number of people to London's latest railway. Formerly Marylebone had a sort of detached air, but all is changed; it may be that the wisdom of having bought land for widening when the line was being constructed will be proved in the near future, for the Great Central of to-day is very different from the old "Muck, Sludge and Lightning" as the Manchester, Sheffield and Lincolnshire was called by the blunt Northerners.

Underground.

I should be puzzled, indeed, to say which is the "London Terminus" of either the Metropolitan or District Railways. The first-named has several which lay claim to front rank: Aldgate, Liverpool Street, Moorgate and Baker Street, all these have claims to urge for pride of place. Perhaps the award should be to Baker Street, with its six platforms and the General Offices of the company. On the District, the task is even more difficult: the General Offices are at St. James' Park, but there are many important stations. The old company used to speak of Mansion House as the "Central City Station," but Earl's Court, Victoria and Charing Cross are not exactly negligible. I have no preference in the matter, so, lest I cause any heart-burning, I will leave you to make choice from those included in a little verse which parodied the late Poet Laureate:—

"Victoria, Victoria!
"Likewise St. James' Park,
"And Charing Cross, and Mansion House,
"And the Lane named after Mark."



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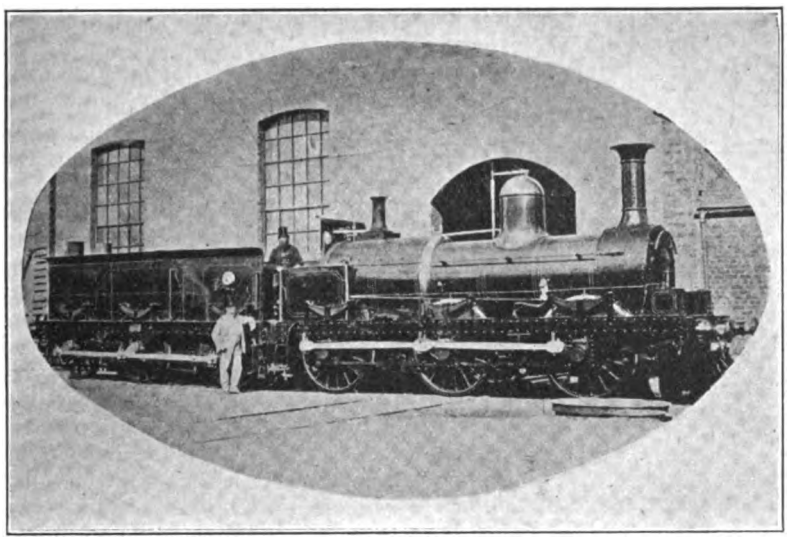
Auxiliary Power for Locomotive Engines.

VARIOUS attempts have been made from time to time in this and other countries to increase the tractive power of locomotives by what may be termed subsidiary easures which can be put in and out of use at the will of the driver. Perhaps the most simple form of "traction increaser" is the change valve applied to compound locomotives to permit of high-pressure or "live" steam being used in the low-pressure cylinder or cylinders, at such times as there is need for greater effort on the part of the locomotive. This, of course, as with the majority of other devices aiming at the same purpose, can only be regarded as a temporary expedient for the reason that it would, if continued for any length of time, throw too great a strain upon the steam productive capacity of the boiler.

The Sturrock steam tenders on the Great Northern Railway were of a more permanent character, and indeed constituted what virtually amounted to a second engine coupled to the main locomotive in front. Of the devices coming within the temporary category, mention might be made of the locomotives with six-wheeled leading bogies on a German railway, the middle pair of wheels being raised from the track when not required and lowered on to the rails when extra power was demanded, these wheels being directly driven on each side by a pair of small steam cylinders.

In America some years ago a good deal of attention was given to evolving a type of mechanism by which a part of the weight of the locomotive could be shifted or transferred by means of a device known as a "traction increaser" to the coupled wheels, thus increasing adhesion at starting or when heavy grades were being negotiated. There was a good deal of discussion at the time as to the value of such an appliance, those who opposed it stating that its use caused deterioration of the track, and also threw added strains on parts of the locomotive mechanism, whilst, if we remember rightly, it was asserted that careless handling of the appliance was likely to lead to all kinds of trouble.

At the present time there appears to be a revival of the traction increasing idea in the United States. The effort at present



G.N.R. LOCOMOTIVE FITTED WITH STURROCK STEAM TENDER.

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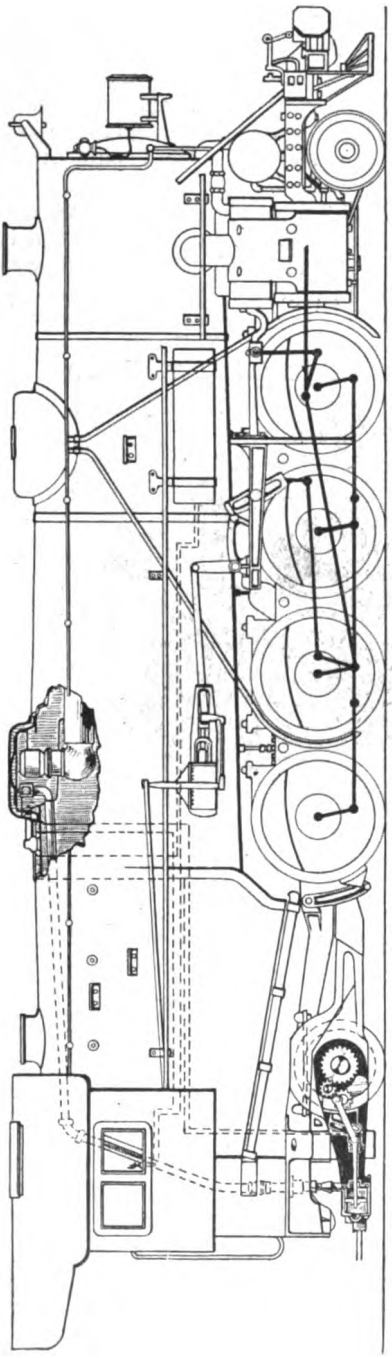
being made, however, is of a somewhat different kind, the idea being that of using the weight on the uncoupled trailing



LOCOMOTIVE FITTED WITH "BOOSTER" MECHANISM, WITH SMALL SUPPLEMENTARY STEAM CYLINDERS DRIVING THE TRAILING WHEELS.

wheels of a locomotive to provide increased tractive effort, and it is claimed that from 25 to 40 per cent. additional tractive power is available at starting or when working on severe grades.

A line diagram is reproduced showing an engine fitted with the device known as a "booster." A locomotive equipped with the device was exhibited at the recent Railroad Convention at Atlantic City, being of the 2-8-2 type, and of the general outline shown in the drawing. As seen, small steam cylinders are fixed horizontally below the cab and drive, through the medium of a connecting rod and gear wheels, the uncoupled trailing wheel of the locomotive through a disengageable spur wheel. Steam for the cylinders is taken from the dome, and from a drawing we have seen of the tender these cylinders would appear to exhaust into the water in the tank. The originators of the scheme state that the locomotive booster was planned with the idea of increasing the reliability of operation by providing the enginemen with additional resources. The governing idea is to make this resource available at desired times, and to improve the average operating conditions rather than to increase maximum train loads. The mechanism has been applied in a manner such as not to interfere with the equation and function of the locomotive or truck, to impose no additional duties on the enginemen beyond the mere act of applying steam to the supplementary cylinders when required, and shutting it off again when normal conditions are reached. In the latter circumstances the device is inoperative, and only at times, such as starting or when making a heavy pull on the road, are the booster cylinders brought into play.

The device takes the form of a complete unit with the connecting rods driving a cross shaft on which is mounted a gear wheel engaging with a pinion, which latter in turn meshes with the main gear wheel attached to the trailing wheel of the locomotive.

In this connection it will be of interest to consider the steam tenders used now nearly 60 years ago by the late Mr. Archibald Sturrock, when Locomotive Superintendent of the Great Northern Railway.

Mr. Sturrock wished to obtain a more powerful engine to work the heavy main line coal trains, and decided to utilise the deadweight of the tender by converting the latter into a separate engine and utilising

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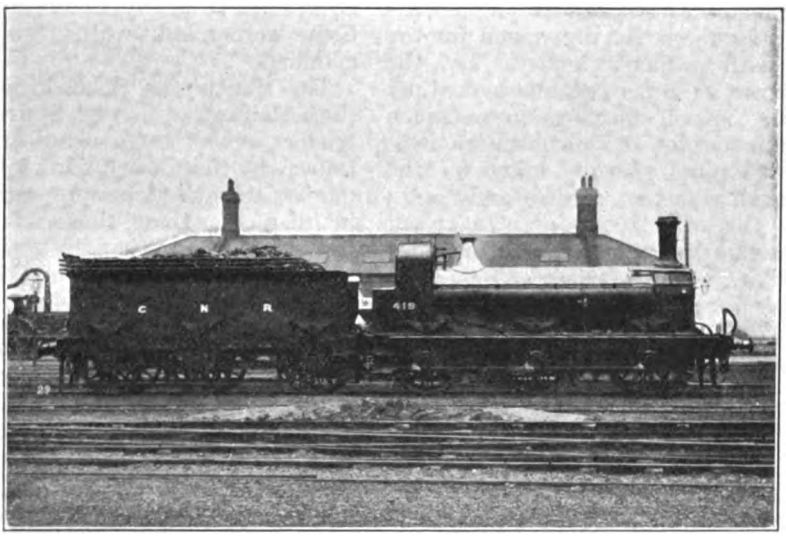
the weight for purposes of adhesion. To this end, in 1863, he altered an old tender by fitting it with small cylinders and motion fixed underneath. Subsequently three old goods engines were provided with steam tenders to work coal trains between Peterborough and London. As the results at first appeared to be satisfactory, a considerable number of new engines delivered in 1865–66 by Kitson, Hawthorn and Neilson were furnished with similar tenders.

The engines themselves had 16-in. by 24-in. cylinders and six-coupled wheels 5 ft. diam. In order to provide increased steaming capacity the hitherto short fire-

In Colburn's "Locomotive Engineering and Mechanism of Railways" they are described as follows:—The tender "has six wheels, and is fitted with a pair of inside cylinders, connected to the middle axle, which is cranked, and the three axles are coupled by means of outside rods. The steam is conducted to the tender through a long pipe from the boiler of the engine, about 23 ft. in length, with five bends, which yields elastically to the various inflections without the intervention of compensation joints. The exhaust steam from the cylinders is delivered into a tubular condenser, surrounded by the water in the tank, consisting of 15 tubes



G.N.R. 0-6-0 ENGINE No. 419
As Rebuilt by Mr. Stirling and fitted with Ordinary Tender.

boxes, which in previous engines had horizontal grates, were considerably lengthened, and the grates were inclined to clear the trailing axles. The firebox heating surface was raised to 113 sq. ft. in some of the engines, and the grate area increased to 23½ sq. ft. The tube heating surface was, however, approximately the same—960 to 970 sq. ft.—as in the old engines.

The steam cylinders under the tender had a diameter of 12 in. and a stroke of 17 in. There were, however, two designs of tenders, of which the earlier ones had wheels only 4-ft. diam., but the later ones, as in the illustration, were provided with 4-ft. 6-in. wheels, In other respects the two designs were practically similar.

2 in. in outside diameter and about 12 ft. 8 in. in length, fixed into a reception box at each end. The first box receives the exhaust steam and delivers it through the tubes; the second is fitted with a waste pipe to carry off the uncondensed steam. The condensed steam, or water formed in the condenser, appears to have had no other exit than by the waste pipe, through which it must have been projected by the uncondensed steam, and, in order to prevent the escape of such projected water, a baffle plate and an inverted cone were inserted at the exit of the pipe."

A double regulator was provided in the dome to supply steam to both engine and tender cylinders. Further, it should be

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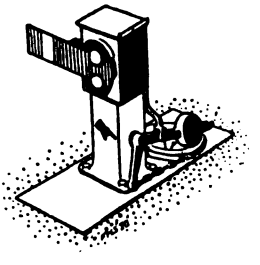
added to the description from Colburn's book, that the condensed water was deflected by the baffle plate mentioned into the annular area round the waste pipe at the top of the tank. This area was perforated with holes, through which the condensed water drained into the tank.

According to tabulated particulars given in the *Engineer*, a series of trials were made in 1866 between five engines fitted with steam tenders and five engines with ordinary tenders. The former consumed 63·7 lb. of coal per mile with an average load of 34·9 wagons, as against the ordinary engine's consumption of 49·3 lb. per mile, with a mean load of 30·2 wagons. These figures work out at 1·825 lb. per wagon for the steam tender engines, as against only 1·632 lb. per wagon for the engines with ordinary tenders, *i.e.*, the former burnt 11·8 per cent. more coal per unit load. The oil consumption was much more in favour of the ordinary engines, being 7·38 pints per 100 miles for the steam tender engine, against only 4·43 pints for the ordinary engine. In favour of the steam tender engine it may be added that, when required, they could haul loads about 25 per cent. greater than the ordinary engines between Peterborough and London.

Curious to relate, this extra haulage capacity to some extent contributed towards their undoing, for many sidings did not accommodate the full 45-wagon load, and the delays with such trains were frequent. To obviate these the loads were reduced, and this reduction did away with the necessity for steam tenders. But the chief reason for their disappearance was that they were thoroughly disliked by the drivers, who objected to having two engines to look after. Moreover, they were somewhat uncomfortable, owing to the water in the tender becoming so hot that after running some distance the exhaust steam would not condense, and was blown out in clouds from the tender waste pipe. The men, therefore, neglected them, and the bill for repairs was correspondingly high. Mr. Patrick Stirling began to suppress them shortly after his arrival in 1866 by converting them into tenders of ordinary pattern. At the same time he increased the power of the engines by enlarging the cylinders from 16 in. by 24 in. to 17½ in. by 24 in., and many of them were rebuilt with 18 in. by 26 in. cylinders.

The Manchester, Sheffield and Lincolnshire Railway also tried Sturrock's steam tenders, six of them being built for this railway by Neilson & Co. in 1865. In these tenders the cylinders were slightly smaller in diameter than those of the Great Northern, being 11½ in. by 17 in.

The Eastern Railway of France copied Mr. Sturrock's design, and two 0-6-0 goods engines were built in 1867 at the Grafenstaden Works for heavy work in Alsace over the Vosges Mountains. The tenders for these engines had wheels 3 ft. 11¼ in. diam., but the cylinders were of the large size of 15-in. diam. by 16½-in. stroke. Similar trouble was experienced in France, and in 1873 the tenders were converted by placing boilers on the frames and making shunting engines of them.



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RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o* RAILWAY MAGAZINE, *30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book," for the current year. Price 5s. By post 5s. 9d.*

"Pop" Safety Valves.

In the ordinary Ramsbottom safety-valve, although steam begins to blow off at the pressure at which the valve is set, the throttling which takes place in the valve when the steam is blowing off in any considerable volume increases the pressure at which it does so. "Pop" valves, however, are designed in such a way as to release a large volume of steam the moment the valve lifts, which accounts for the suddenness with which blowing off commences and ends in such cases; as a result all the excess pressure of steam is released practically at the exact pressure at which the valve is set, and the greater reliability of these valves accounts for their increasing use at the present time.

[Reply to "B.R." and "SUPER G.C.R."]

"Precursors" *v.* "Experiments," London and North Western Railway.

Supersession of the "Experiment" class engines on express passenger service, and to a large extent of the "Precursors" also, is due to the fact that there are now more than sufficient of the more efficient superheated 4-4-0 and 4-6-0 classes to perform all these duties. Of the two types the "Precursors," with their larger wheels, are commonly the more speedy, but exhaustive experiments some years ago proved the "Experiments" to be the more economical in fuel consumption.

[Reply to "L. AND N. W."]

Eastern and Midlands Railway.

Commencing with the Norwich and Spalding Railway, the Spalding-Holbeach section was opened about 1855. In 1877 this and other lines were amalgamated as the Midland and Eastern Railway, and in 1883 further amalgamation produced the Eastern and Midlands Railway, since 1897 the Midland and Great Northern Joint Railway. Of the present total length (owned or joint) of 205 miles, 110 are single-track. There are 95 locomotives, mainly 4-4-0 and 0-6-0, and they are painted a fairly bright yellow.

[Reply to R. T. NINNIS.]

Locomotive Power Classification.

Queries concerning letters and numerals placed on locomotives have been so often answered that we must ask readers to refer back before submitting them again. Unless denoting sheds—and such indications are usually distinctively placed—letters and numerals generally show the power classification of the engine, this governing the loads they may be given on various sections. On some lines, notably the Great Western, colours are also used to indicate to what extent the engines are not allowed over certain sections.

[Reply to W. T. HODKINSON AND OTHERS.]

Classification of Small Locomotives.

As far as we can ascertain the principle of power classification of locomotives is

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not carried so far as to include small engines used for shunting and for light and miscellaneous duties. The object of classification is to govern the loading of engines which may be used for standard traffic, and as it would be altogether exceptional for the small engines to be concerned therewith, obviously they can hardly come within its scope. Primarily power classification is a traffic measure.

[Reply to "EAGER" AND "ATLANTIC."]

Great Northern Railway Locomotives at Victoria, South Eastern and Chatham Railway.

Presumably Great Northern Railway 0-4-4 tank No. 931 had worked horse-boxes or parcels vans round to Victoria, South Eastern and Chatham Railway, during the interval of one hour between the occasions you saw it at King's Cross and Victoria respectively. The route taken would be *via* the Metropolitan Railway and through Ludgate Hill to the South Eastern and Chatham Railway.

[Reply to W. E. WHISHTON.]

London-Oxford Train Service.

Very little alteration took place in the London–Oxford train service consequent on the opening of the short route from London to Birmingham *via* Bicester, seeing that prior to that event all the principal expresses to and from the north passed Oxford without stopping. The Oxford service was provided by semi-fast Birmingham trains and also by West Midland trains, as is still the case. We know of no conditions of the nature mentioned in your query.

[Reply to "Ex-R.T.O."]

Rolling-Stock on American Lines.

Generally stated, passenger cars range from 70 to 90 ft. or more in length over couplers; width, 9 ft. to 10 ft. 6 in.; total height above rails, 15 ft., and height inside, 8 ft. 9 in. Baggage and other cars are usually somewhat shorter. Coal cars may be taken as about 43 ft. long over couplers and up to 10 ft. 6 in. wide over all. Box cars about the same size and up to 14 ft. high above rail level.

[Reply to J. F. COLAHAN.]

Tank Locomotives.

In addition to the London, Brighton and South Coast Railway and London and North Western Railway, tank engines are used regularly for express train working on the Lancashire and Yorkshire, Midland (London, Tilbury and Southend section), North Staffordshire and Great Western Railways, and, to a lesser extent, on the North Eastern, Caledonian and South Eastern and Chatham Railways.

[Reply to R. W. HANBIDGE.]

Shunters' Platform Trucks, G.W.R.

The small four-wheeled trucks you have noted attached to Great Western Railway shunting engines working in goods yards are provided for the accommodation of shunters and for their equipment, so that they need not crowd upon the engine or hang on to a vehicle during shunting movements. The practice is, we believe, peculiar to the Great Western Railway.

[Reply to W. UPTON.]

The Great Central Railway and Banbury.

The 9.35 a.m. from Banbury works through to Leicester, calling at Woodford, Rugby and Lutterworth, and is due at 10.44 a.m.. In addition the 12.45 p.m. (from Swansea), and the 10.40 p.m. (from Swindon) out of Banbury, running over this branch, work through beyond Woodford, to Newcastle and York respectively.

[Reply to "RUGBEIAN."]

Speed Restrictions, Great Central Railway.

Nominal speed restrictions from Marylebone to Woodford *via* Aylesbury are 30 m.p.h. as far as Canfield Place, 40 at Neasden Junction, 30 at Harrow, 20 at Rickmansworth, 25 at Quainton Road Junction, and 35 at Grendon Underwood Junction. For Wycombe line trains the restriction at Neasden is 25 m.p.h.

[Reply to "F.Y. AND N."]

Colours of American Rolling-Stock.

Mr. E. G. Macculloch writes from Halifax, N.S., that it is not now so usual for certain trains to be painted differently from the general stock of the owning line. He also mentions that the Canadian Pacific Railway are now painting their coaches crimson lake instead of natural mahogany, due to the introduction of steel construction.

[Further reply to "C. P. R."]

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Slipping Coaches.

On the London and South Western and Great Northern Railways (on both of which this practice was at one time extensively employed) the use of slip coaches died out gradually. The Doncaster slip of the up Great Northern Railway day "Scotsman," survived until the war. [Reply to "Ex-R.T.O."]

4-4-2 Tank Engines.

We do not give locomotive dimensions, but the weight in working order of the superheated North Staffordshire Railway 4-4-2 tank engines is 70 tons, and of the Midland (London, Tilbury and Southend section) 4-4-2 engines (large class), 68 tons as originally built, and 68¾ tons as rebuilt.

[Reply to "PRECURSOR TANK."]

Auto-trains, Great Eastern Railway.

The Lower Edmonton–Cheshunt line has been closed for ordinary traffic for some years past. The only section where "auto-trains" are now used is that from Seven Sisters to Palace Gates, in connection with the new suburban services described in the August RAILWAY MAGAZINE.

[Reply to "CHELTONIAN."]

Tank Engine Coal Bunkers.

The raised back to the bunker of 4-4-2 tank, No. 1509 on the Great Northern Railway (and other engines of the same type) is so shaped in order that the bunker may carry more coal, but in such a way as not to obscure the cab windows when the engine is running bunker first.

[Reply to D. W. ALLEN.]

Lettering on Carriage Underframes.

Letters such as W, V, S, &c., painted on the underframes can usually be identified according to application. Thus W will indicate Westinghouse brake, V vacuum, S steam-heating, or otherwise, according to particular cases. In other cases letters indicate the class of vehicle, &c.

[Reply to "VAUCLAIN."]

South Eastern and Chatham Railway, Permanent Way.

It is not a new idea to chamfer the ends of adjoining rails and fit them together in joint chairs in order to obtain a continuous track, and presumably an experiment therewith is being conducted at the place you mention. [Reply to F. W. H.]

"Quarry" Line, London, Brighton and South Coast Railway.

You are correct in your supposition. Beyond Coulsdon Station the new line does cross the public road at each end of a short tunnel through a hill, this combination being necessitated by the conditions of the location.

[Reply to G. W. B."]

Vestibules for Postal Vans.

As the shelving in postal sorting vans is mainly on one side it is obviously more convenient to locate the connecting vestibules towards the opposite side instead of centrally, so that access does not interfere with the sorters while at work.

[Reply to "VAUCLAIN."]

North Eastern Railway Locomotives.

The only published "list" is in Mr. J. S. Maclean's book, "The Locomotives of the North Eastern Railway," but a large number of new locomotive types have come into existence since the last edition was published.

[Reply to W. P. PLUNKET.]

4-6-0 Engines on North Main Line, Great Western Railway.

Four-cylinder 4-6-0 engines now work through without restriction north of Wolverhampton. We cannot "carry forward" into succeeding issues questions in excess of the maximum of two.

[Reply to "AULD REEKIE."]

The "Claughtons" and Birmingham, London and North Western Railway.

Four-cylinder 4-6-0 engines of this type work into New Street frequently, but locomotive workings are changed so constantly that it is impossible to specify any train on which you will invariably find one.

[Reply to "RUGBEIAN."]

Locomotive Lists.

We do not undertake to supply lists of locomotives on various railways. Please see advertisement pages for publications which include lists. For total numbers of engines of each class owned by various railways see RAILWAY YEAR BOOK.

[Reply to W. E. WHISHTON.]

Hockerill Halt, Great Eastern Railway.

Situated between Bishop's Stortford and Takeley on the Dunmow and Braintree branch, this halt serves the Bishop's Stortford golf course. Trains call as required.

[Reply to "CHELTONIAN."]

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Midland Railway Safety Valves.

The small pillar seen behind the main safety-valves of certain Midland locomotive types is an auxiliary safety-valve. In some other types this auxiliary valve is contained within the main safety-valve casing.

[Reply to "SUPER G.C.R."]

Track Circuit Boards.

Presumably you refer to the markers placed on signals controlling track-circuited sections to indicate that it is not necessary for the fireman to go to the signal-box as a reminder of a train kept waiting.

[Reply to H. A. POPER.]

No. 1361, "Prospero," London and North Western Railway.

Doubtless the engine to which you refer is No. 1361 which, originally of the 4-6-0 "Experiment" type, has been re-built experimentally with four cylinders and a superheater.

[Reply to REV. W. MACHIN.]

London Bridge Station, South Eastern and Chatham Railway.

Up trains starting from this station are on sharp curves, and moreover, usually go off gently in view of the closeness of signals and probable delays immediately ahead.

[Reply to H. POPER.]

Railways of Venezuela.

These have several times received attention in the RAILWAY MAGAZINE, but only incidentally as regards articles in recent years. Brief particulars of these lines are included in the 1920 edition of the RAILWAY YEAR BOOK.

[Reply to J. D. C.]

0-6-2 Tank No. 1598, Great Northern Railway.

Difference in external appearance and sound of exhaust in this engine, as compared with others of the same class, is due to the fact that No. 1598 has been superheated.

[Reply to "G.N.R. ENTHUSIAST."]

Great Northern Railway Locomotive Depôts.

We are obliged for your note that No. 990 is at present stationed at King's Cross. Space cannot be devoted to the present stations of engines, which are moreover, continually liable to change. We understand that No. 1000 is at present stationed at Doncaster and No. 1001 in London, but ere these lines appear in print they may be transferred. They are employed on main line goods and passenger duties. [Reply to R. D. WOLDREY.]

Great Western Railway Rolling-Stock.

We understand that the code names "Bloater" and "Siphon" refer respectively to four-wheeled fish vans and to six-wheeled milk vans. There is also a four-wheeled variety of the latter known as "Siphon C." [Reply to E. CRICKMAY.]

Lynton and Barnstaple Railway.

A short article dealing with this interesting line appeared in the RAILWAY MAGAZINE, May, 1917. It has also received attention in earlier numbers, though they are all long since out of print.

[Reply to J. D. C.]

Transatlantic Sailings from Southampton.

Special boat trains are run by the London and South Western Railway between London and Southampton in connection with the Transatlantic steamer sailings.

[Reply to R. W. HANBIDGE.]

Weeds on Railway Track.

Weeds do not affect the strength of permanent way so much as they interfere with its drainage. The good order in which track is kept is usually in proportion to the resources of the company owning it.

[Reply to "VENT."]

Middleton Junction, Lancashire and Yorkshire Railway.

There is no specified restriction of speed for express trains passing through this station on the main lines.

[Reply to "B.R."]

2-6-4 Express Tank Engine No. 790, South Eastern and Chatham Railway.

A large folding plate and full dimensions were given in the RAILWAY MAGAZINE, May, 1918. [Reply to E. M. D.]

Midland Locomotives.

It is correct that 4-4-0 engines Nos. 700 and 768 on this railway are equipped with the Weir feed-water heating apparatus.

[Reply to "SINGLE-WHEELER."]

Manchester and Milford Railway.

This line was amalgamated with the Great Western Railway in 1911.

[Reply to R. T. NINNIS.]

Midland Locomotive Weight Restrictions.

We have no further information.

[Reply to R. CHARLES FORD.]

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Great Central Railway Memorial Locomotive.

In adding to the "Lord Faringdon" class of four-cylinder 4-6-0 locomotives, Mr. J. G. Robinson has fittingly inaugurated the new series by constituting the first of them a memorial engine, appropriately named *Valour*. No. 1165, a photograph of which is reproduced as frontispiece to this issue of the Railway Magazine, bears also the inscription :—

"In memory of G.C.R. employees who gave their lives for their country, 1914–1918."

The engine is a duplicate in all respects to No. 1169, "Lord Faringdon," excepting that the cab is fitted with side windows. Included in the design are the Robinson standard superheater (28 elements), and circulating steam device for keeping the elements cool when steam is shut off from the regulator, thereby dispensing with all dampers and draught retarders in the smokebox. The "Intensifore" lubricator is also employed, with distributing boxes and sight-feed glasses on the front of the firebox, supplying oil to all cylinders and valves and coupled axleboxes, and being under the driver's observation, enables him to be satisfied that proper lubrication is going on without requiring to leave the footplate of his engine. We are informed that a series of 4-6-0 goods engines are being constructed to the same general design, but with 5 ft. 8-in. coupled wheels.

Improvement in Railway Travel.

Writing as Chairman of the Brighton and Hove Season Ticket Holders' Association, Mr. Harvey Clifton offers several useful suggestions, some of which are certainly worthy of careful consideration. As he points out, long distance season ticket holders, whether by choice or compulsion, contribute materially to the relief of the housing problem, and however reasonable the railway charges may be, on the more favoured routes they provide by no means an insignificant share of the railway passenger traffic. In some cases, compartments are reserved for parties who regularly travel together, and there are instances where saloon or special vehicles are run for their benefit; yet as a rule they have to take their chances with other passengers.

Seeing that a business-man can often use his journey time to advantage, there is much to be said for Mr. Clifton's proposal that long distance season ticket holders should be able to look forward to a future when trains of Pullman or saloon cars will be run, providing registered seats for each regular passenger, and with tables whereon he can write or place papers or books. He advocates even one section of such a "super-train" where silence is a rigid rule and not the exception, for the benefit of the studious or those who like to be able to read or prepare for business without interruption from adjacent conversations.

Pending developments of this kind, Mr. Clifton suggests that regular passengers should be able to reserve seats until, say, 5 minutes before departure time, for which reservation a nominal fee might be added to the cost of the season ticket.

Railway Expenditure.

In order to assist the Rates Advisory Committee in their enquiries, Sir J. G. Beharrell, Director-General, Finance and Statistics Section, Ministry of Transport, prepared a series of estimated train-mile costs for the year 1920-21, to show the total anticipated expenditure on railway working during the current year. As they are estimates only, certain ratios were necessarily adopted, where ordinarily no dividing line is recognised, as between cost of maintenance of way, etc., allocated to passenger and freight traffic, and these are based upon the average division ratios which operated during the first four four-weekly periods of 1920. Shunting miles are accepted for maintenance of way and works purposes on the basis of four shunting miles equalling one train or "other" mile.

These figures apply only for controlled

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railways, but in order to indicate how enormously railway costs have increased we may compare them in passing with those of 1913, which covered all railways, and without making any allowance for that difference.

Thus Sir George Beharrell divides the total estimated cost of £35,000,000 for maintenance of way and works into £17,643,000 for passenger traffic, and £17,357,000 for freight traffic. In 1913 total expenditure on all lines under this heading was £12,562,165. Maintenance and renewal of rolling-stock is estimated at £40,600,000 (including £600,000 for the Government pool arrangement), divided £19,076,000 passenger and £21,524,000 freight, against a total of £13,823,094 in 1913. Locomotive running expenses give another £57,000,000 (passenger £17,242,000 and freight £39,758,000), as compared with £18,166,048. Traffic expenses reach the figure of £68,000,000 (£33,245,000 passenger and £34,755,000 freight), against £24,179,563 in 1913.

The "Expensive" Departments.

THESE are the big items, but unfortunately they represent by far the major portion of the burden, and it will easily be understood that only exceptional methods and the correlation of all operations can enable railways to pay their way with charges increased by an average of 100 per cent. *or less* to meet expenditure which has reached totals an average of three times those of 1913. It is worthy of note that items such as general charges, rates and taxes, &c., show much more moderate increases, thus indicating that directors' fees, salaries of general managers and secretaries, head office expenses, or even rises in rates and taxes, are not expected to account for any large proportion of the expenditure. Under the heading of miscellaneous there is even a decrease—£400,000 against £582,514 in 1913, while only £225,000 is allowed for Law charges, whereas that heading, together with Parliamentary expenses, absorbed £242,625 in 1913.

Accepting the maintenance of way and works, rolling-stock, running and traffic departments as those primarily concerned with the working of a railway, they are together estimated to cost in the year 1920-21 no less than £200,600,000, leaving a balance for remaining headings of £18,100,000. In 1913 the former total was £68,730,870 and the latter £10,143,374. And even these figures do not quite complete the story seeing that a further £13,800,000 is added to the total expenditure to cover the recent wages awards, which mainly affect departments already the most expensive.

The Other Side.

THERE are, of course, other aspects which help to explain how it may be possible to operate railways without loss on the basis of, say, 100 per cent. increases in charges to meet expenditure up by 200 per cent. For example, estimated receipts for 1920-21 of £210,000,000 from passenger traffic and £219,500,000 from freight, total £429,500,000, compare with £124,860,092 in 1913. On first inspection this suggests a favourable comparison, and in view of the fact that it is intended to place the railways upon a paying basis this is in accordance with the object aimed at. It has to be remembered, however, that very large increases have occurred in numbers of passengers and tonnage of goods and minerals conveyed, although the total engine miles now run are less than those of 1913, 503,087,609 estimated for 1920-21 as compared with 628,324,150 seven years ago. Passenger and goods increases involve both increased labour and increased receipts, although the reduction in engine miles, partly enforced by shortage of locomotives and rolling-stock, is largely attributed to altered methods and improved systems of operation, by which means only could it be achieved.

Railway Rate Increases on American Railways.

ALTHOUGH their position is different in some respects, the problem of higher costs and advances in wages has had to be faced by American railways, as here. The problem was to provide additional revenues of approximately $1,550,000,000, or sufficient to enable the railroads to pay the increases in wages recently awarded by the Railroad Labour Board, amounting to $618,000,000 a year, and to increase the net operating income to 6 per cent. on a valuation of $18,900,000,000, which would represent $1,134,000,000 a year.

The Inter-State Commerce Commission has allowed the 20 per cent. increase in passenger and baggage rates, and the 50 per cent. surcharge for Pullman passengers, proposed by the companies, but makes the increase in milk traffic 20 per cent. instead of the percentage proposed for freight. On freight traffic it allows practically the amount asked except in the case of the southern roads which are allowed 20 per cent. in freight rates as against the request for 38·91 per cent. The Eastern roads are allowed 40 per cent. against a request for 39·75 per cent. The Western roads as a group asked for 32·03 per cent.; but the Commission places the lines west of Colorado in a separate Mountain Pacific group, which it allows 25 per cent. and gives the roads in the rest of the western territory 35 per cent.

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A new Folkestone-Flushing Liner.

In pre-war days a particularly popular route from London to the Continent was by the South Eastern and Chatham Railway to Folkestone and thence across Channel by the Royal Dutch Mail Service of the Zeeland steamship Company. In 1913 the passengers, mostly tourists and business men, numbered 170,000 and in 1914—200,000. The good esteem in which the route was held was chiefly due to the prompt and quick service made by steamers of the most modern type, equipped with the latest improvements and safety appliances.

ZEELAND SHIPPING COMPANY'S NEW STEAMER "PRINSES JULIANA" ENTERING FOLKESTONE HARBOUR.

Notwithstanding the steamers lost during the war (one steamer being torpedoed while carrying invalids) and the uncertainty of the present-day economic situation it has been decided to develop the Folkestone-Flushing route and to this end there has been placed in service a new steamship—*Prinses Juliana*, the first of three twin-screw steamers to be built by the Schelde Shipbuilding & Engineering Company of Flushing.

Built to Lloyd's rules and certified to carry 800 passengers, the leading dimensions of the *Prinses Juliana* are :—

Length overall	..	364 ft.
Breadth overall	..	454 ft.
Depth ...	..	2,510 ft.
Speed	..	22·6 knots.
Horse-power	..	10,000.
Gross tonnage	..	3,000.

There are five decks giving an ample covered promenade above and below; the former is 195 ft. in length, measures 5,400 sq. ft. in area and is completely protected by the boat deck. As the vessel is designed primarily for the night service more than ordinary care has been bestowed on the sleeping accommodation. In the first class sleeping accommodation is provided for 270 passengers, and in the second class for 110 passengers.

The safety appliances carried are as complete as possible and they include watertight bulkheads, lifebelts, lifeboats, wireless telegraphy, emergency lights, alarm bells and submarine bell signals.

Of the propelling machinery it may be briefly stated the twin screws are driven by a set of four-crank triple-expansion engines, balanced on the Yarrow-Schlick and Tweedy system. The propellers are built up, three-bladed and carefully balanced. The starting position is between the engines, and it is therefore possible for one engineer to have control of both engines whilst manœuvring. All of the auxiliary machinery is duplicated to provide against emergencies

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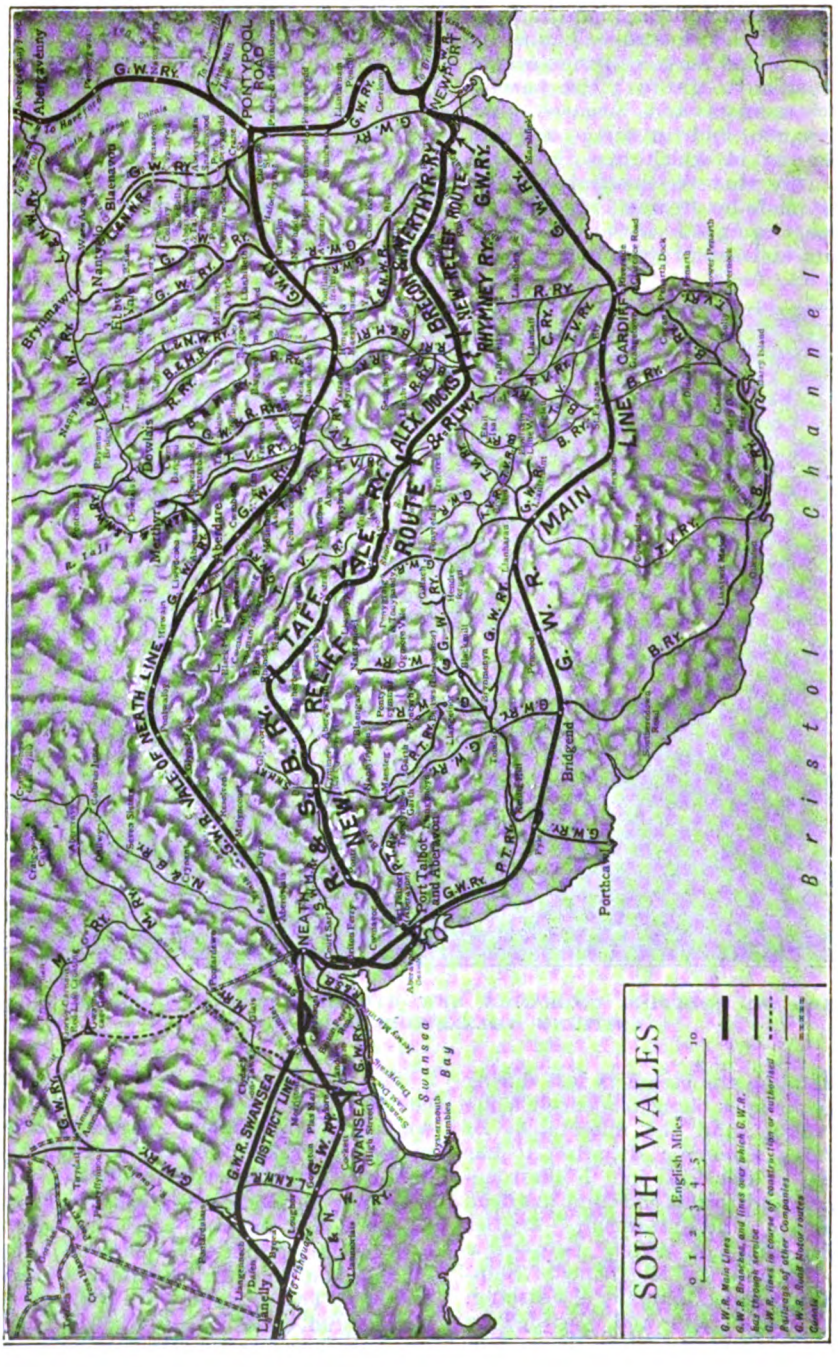

SKETCH MAP SHOWING RELIEF ROUTE FOLLOWED BY GREAT WESTERN RAILWAY NEWPORT-ABERYSTWYTH PASSENGER TRAINS AS BETWEEN NEWPORT AND LLANELLY.

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in case of breakdown. Four large boilers, of an aggregate of 11,000 h.p. and worked on the newest system of forced draught, supply steam to engines which, when running at the full speed of 22·6 knots, develop about 10,000 h.p.

Railway Communication in the South.

FROM Margate to Weymouth and in Devon and Cornwall the south coast is either exceptionally or reasonably well provided with railway facilities, but a Weymouth reader points out how inconvenient it is to get from place to place along the intervening section. He has favoured us with a long dissertation, suggesting that certain new lines and connecting links should be made, but this can only occur if a sufficiently strong case can be made out and adequate support secured to justify construction by one of the railway companies, the formation of a new company to build either a standard or light railway, or possible action by the Ministry of Transport. In any case it is exceedingly improbable that anything could be done for some years ahead.

At the same time there are several points in his letter which are worthy of reference. It is suggested that link lines between Abbotsbury and Bridport, and thence to Seaton Junction would be of great value, the latter especially, as it would connect Bridport and the Weymouth line with the London and South Western main line, which gives good facilities for travel further west. At present journeys between many places, though they may have branch lines serving them, are often necessarily very roundabout and take much time and involve considerable expense and several changes. To travel from Weymouth to Exeter is not always a simple matter even by joining the Great Western Railway direct route *via* Westbury. In the ordinary way to get from Weymouth or Dorchester to Exeter, about 47 miles as the crow flies, it is necessary to travel either via Yeovil (Pen Mill), Yeovil Town and Yeovil Junction, changing at all three, or via Yeovil (Pen Mill) and thence to Taunton, changing at both places. By extending the Abbotsbury line to Bridport (about 7 miles), and thence to Seaton Junction or Axminster (11 miles) a great part of the difficulty of travelling would be avoided. Possibly, owing to the hilly country between Abbotsbury and Bridport that section might be considered unduly expensive, but in any case the Bridport—Seaton Junction or Axminster section should prove a valuable connecting link.

A New Composite Route in South Wales.

IN order to afford some relief to the Great Western main line in South Wales, which at the present time is very congested, an interesting experiment is being made by running a through train between Newport and Aberystwyth *via* an entirely new route for through running, by co-operation with the Brecon and Merthyr, Rhymney, Alexandra (Newport and South Wales) Docks, Taff Vale and Rhondda and Swansea Bay Railways.

The train made its first trip on August 21, and runs on Fridays, Saturdays and Mondays, leaving Newport at 12.45 p.m., and arriving at Aberystwyth at 6.5 p.m. On the return journey the train leaves Aberystwyth at 1.10 p.m., and arrives at Newport at 7 p.m. In addition to affording relief to the main line, several mining districts in South Wales are placed in direct communication with the Welsh holiday resorts. The map reproduced on the opposite page shows the route taken by these trains.

Leaving Newport the route followed is over the Great Western Western Valleys line as far as Bassaleg, thence over the Brecon and Merthyr Railway to Caerphilly. The train then runs for a short distance over the Rhymney Railway and thence over the Alexandra Docks Railway to Pontypridd. From that point the Taff Vale Railway is used to Treherbert. The train then runs over the Rhondda and Swansea Bay Railway to Court Sart, and continues *via* the Swansea District Railway to Llanelly. From that point the train follows the ordinary Great Western main line route to Aberystwyth *via* Carmarthen and Pencader.

Railways in the Malay Peninsula.

IN his annual report on the Federated Malay States for 1919, Sir E. L. Brockman (Chief Secretary) gives some information about the railway system which is of general interest. The capital account now stands at £14,429,550, as against £12,710,081 at the end of 1918. Gross receipts amounted to £1,718,602, and the net profit earned last year amounted to £386,218. During the past three years the Federated Malay States railways have contributed the sum of £204,755 to the Imperial Government for war purposes.

No new lines were opened for traffic during the year and the increase in mileage of running lines was inconsiderable. Five new stations and five new " halts " were opened, making at the end of the year a total of 212 permanent and 26 flag stations (or " halts ") open for traffic.

Train services in connection with the Siamese Royal State Railways, inaugurated

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on July 1, 1918, has resulted in the development of a considerable traffic, both passenger and goods, between Siam and Malaya. The passenger service over the Siamese railways is at present on alternate days, and the time occupied on the journey between Singapore and Bangkok is four days. It is hoped that the service will shortly be accelerated by the running of express trains over the Siamese system.

The statistics of passenger traffic are of considerable interest, especially as compared with those for goods traffic. The receipts from goods trains show an increase of 9 per cent. only (as compared with 1918) while passenger receipts have increased by 17·3 per cent.

seriously affected traffic during the war has been partly remedied by the receipt of the 14 American locomotives ordered, as explained in the report for 1918, in consequence of inability to obtain supply from the United Kingdom. The average daily mileage per engine during the year was 108·25, as against 110·11 in 1918. In view of the difficulty and delay in obtaining steel trucks from England, 350 trucks of different types were constructed locally of timber. This experiment proved most economical, as, apart from the fact that the locally-made trucks were at work and earning revenue during the year, the cost of building, as compared with the cost of the imported article, represented a saving of £66,700.

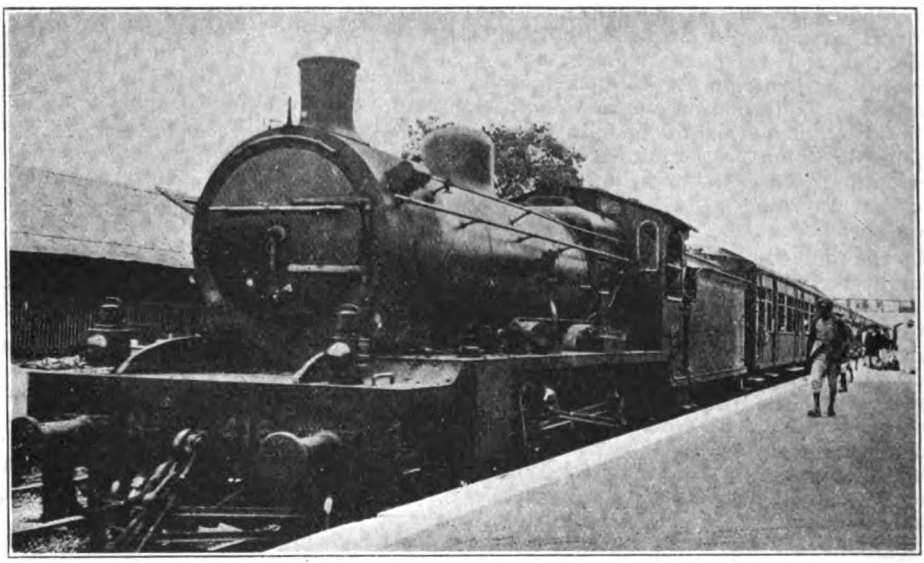

Photo.] **GREAT INDIAN PENINSULA RAILWAY.** [*B. D. Sullock.*

4–6–0 Superheater Locomotive No. 416 at Manmad Station.

The relation between the increase of wages and the number of passengers carried is a perfectly well known phenomenon, and in Malaya the inference is peculiarly well marked by the figures for the percentage increase of passengers of different classes :—

	Per cent.
First-class	33·41
Second-class	30·56
Third-class	11·41

These figures tend to confirm the general impression of the average traveller that there is a steady migration from the third to the second, and still more from the second to the first-class accommodation.

The shortage of locomotives, which so

Three new steam boats—two stern wheelers and one tug—were added to the railway fleet during the year.

Total expenditure during the year on construction and surveys of new lines amounted to £893,106, as compared with £274,660 during 1918. Progress was made with the extension of the East Coast Railway, which runs through the State of Pahang, and will connect with the Siamese system on the eastern side of the Peninsula. Substantial progress was also made by the contractors with works connected with the new jetty and wharf at Prai (Penang). Reclamation was impeded by difficulty in retaining the dredged materials, but this difficulty has since been satisfactorily dealt with. Work

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on cylinder sinking for the jetty began in May, and satisfactory progress was made during the remainder of the year. The contract for the construction of the causeway across the Straits of Johore was let in June to the same contractors who are handling the works at Prai referred to above, namely, Topham, Jones & Railton, Limited. Considerable progress was made before the end of the year in temporary and preliminary work. The term for completion of all work on and in connection with the causeway is five and a quarter years.

Fast Running on the G. I. P. Railway.

SUPPLEMENTING two logs of noteworthy runs on the Great Indian Peninsula Railway, published in the December, 1919, RAILWAY MAGAZINE, Mr. B. D. Sullock, of Bombay, sends particulars of a further one on the same railway, but on the north-east section. The train concerned was the Punjab Mail, which runs between Peshawar, Delhi and Bombay, a total distance of 1,593 miles, the last 75 miles being described. Leaving Kasava at 2.58 p.m., with a load of six 8-wheeled bogie coaches and one 12-wheeled dining car (250 tons), No. 416, a 4-6-0 superheater engine built in 1914, had to face a strong head wind, in showery weather. Thansil, 12¼ miles, was passed in 19'min. 19 sec., Khadavli (30¼ miles) in 43 min. 20'sec., and 'Kalyan' Junction 'was reached in 59 min. 4 sec. (booked 61 min.). for the run of 41¾ miles. Thence to Bombay is the suburban area, and there are four tracks, except between Diva and Thana, where there are temporarily only two. At each end of this section a service slack to 10 m.p.h. was carefully observed. Leaving Kalyan Junction punctually, the last 33¼ miles into the Victoria terminus at Bombay were covered in 47 min. 35 sec. Net speed works out at 43 m.p.h.

Kasara station is at the foot of the Thull Ghaut incline. In ascending this special 0-8-4 or 2-8-4 tank engines assist the train engine up the 6 mile gradient at 1 in 37.

Mr. Sullock sends several photographs, one of which is reproduced, showing the engine referred to on the Punjab Mail, but at Manmad station, 162 miles from Bombay.

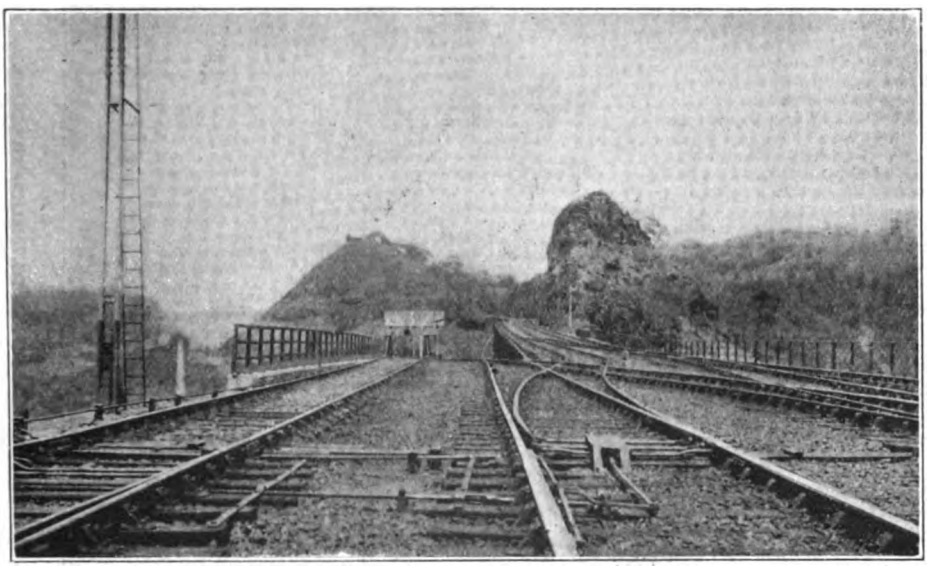

Photo.] **GREAT INDIAN PENINSULA RAILWAY.** [*B. D. Sullock.*

Reversing Station on the Bhore Ghaut.

A Trolley Ride down the Ghauts.

THE same correspondent also sends a description of a trip by inspection trolley down the Bhore Ghaut incline, 64 miles from Bombay, on the south-eastern section of the Great Indian Peninsula Railway.

"One day during the monsoon a friend and the writer left Bombay by the 7.55 a.m. Poona breakfast car express in which we proceeded as far as Lonavla, 80 miles from Bombay, and situated at the top of the incline. Here we left the train, and after a short inspection of the various engines in

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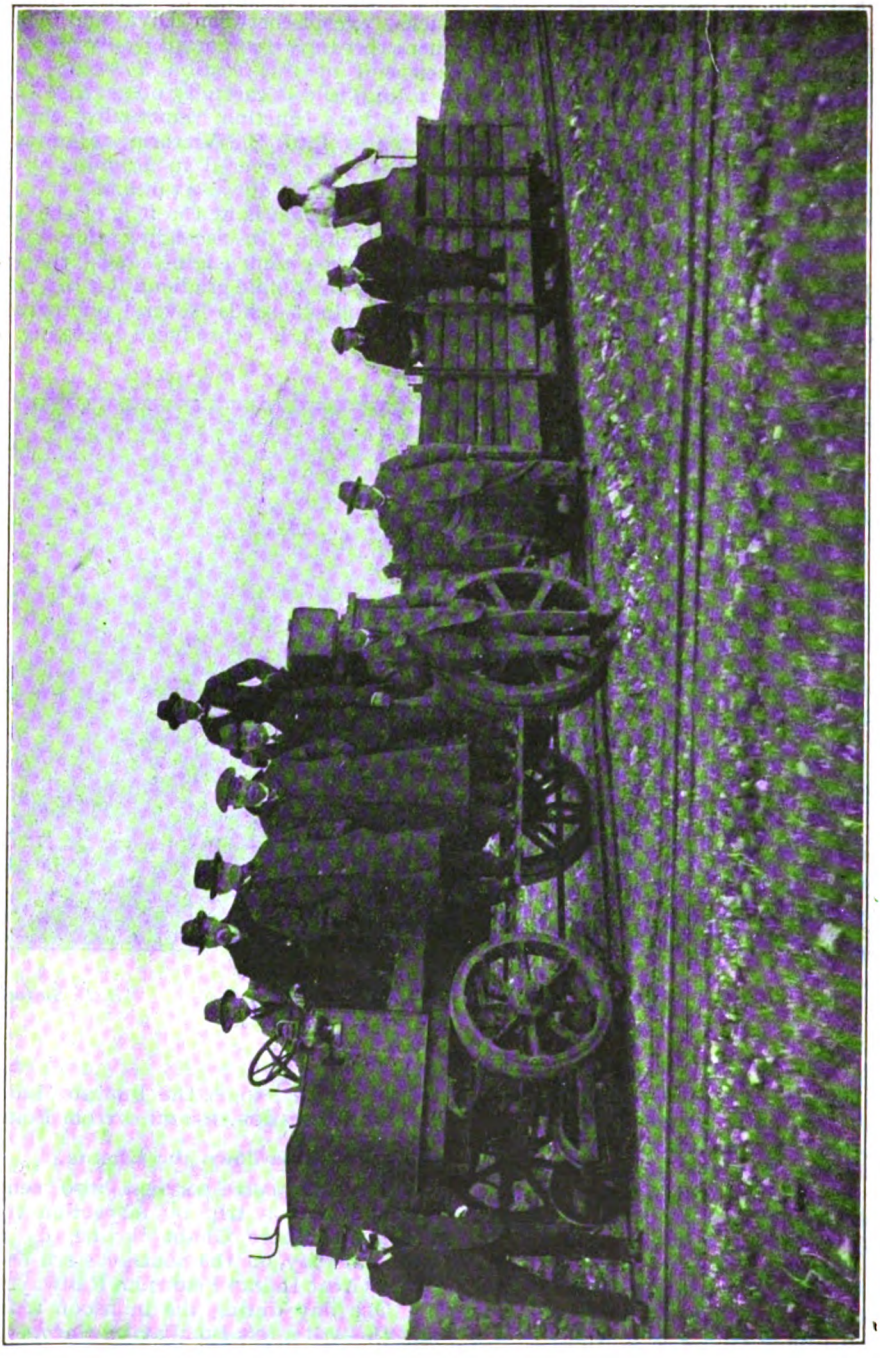

THE STRONACH-DUTTON LOCO-TRACTOR.
Inspection by Sir William Hoy, and other officers of the Union of South Africa Railways.

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the sheds, which included 4-6-0 tender engines, both Great Indian Peninsula and Eastern Bengal (temporarily loaned to the Great Indian Peninsula), 4-4-0 tender, 0-6-0 goods, and the Ghaut 2-8-4 and 0-8-4 side tanks, we mounted our trolley and commenced the 17½ mile run down to Karjat at the foot.

"Besides the writer and friend there were on the trolley a brakesman and four trolleymen. The first station down the incline is Khandala (2¼ miles), prettily situated on a curve with a catch siding at the lower end. Khandala is a favourite week-end resort for Bombay people. Shortly after leaving Khandala we proceed through the first tunnel (of which there are 26 in the course of the descent), and reach Battery Hill Cabin. Here there is also a runaway loop which runs up a steep hill. All descending trains must come to a dead stop, as the points are normally set for the siding. A half mile further on brings us to the Bhore Ghaut reversing station. The 11¼ miles from here to Palasdhari station are continuously down at an average gradient of 1 in 37. We pass through 25 tunnels and over eight viaducts, beside several smaller bridges. There are two block cabins in this section, viz., Thakervadi and Mowke Mulla. The scenery is magnificent and in the monsoon season one experiences all the changes of bright sunshine and rain showers. The tunnels drip with water and everything looks wonderfully green. Palasdhari station, which has no platform, is the junction for Khopoli, the station for the Tata Hydro-Electric Works which supply Bombay with electric power. This branch, which is single, boasts one train a day in each direction worked by an old 0-6-0 goods engine dating back to 1875. The line winds round the valley at the foot of the Ghauts for about 9 miles. Khopoli station can be seen quite plainly from the reversing station. Palasdhari to Karjat (2 miles) is practically level and here the trolley men come in and soon push us into Karjat.

"Karjat has four running lines, two platform and two centre through lines. All trains stop here to drop their 4-6-0, 4-4-2 or 2-8-0 engine as the case may be, and are taken up to Lonavla by two Ghaut tanks. These latter are of two types, viz., 2-8-4 and 0-8-4, the former have two cylinders, 20 by 26, and coupled wheels, 4 ft. 3 in., the latter have 22 by 26 cylinders and coupled wheels of the same diameter. They are stabled at Lonavla.

"For the ascent of the incline one tank is at the head of the train, and the other at the rear. For the descent both engines are at the head—sometimes descending trains only have one engine. Ascending engines always take water at the reversing station The ascent from Karjat to Lonavla takes about 80 min. and the descent about 70 min. Making up time is strictly forbidden on the incline.

"Lonavla is 2,027 ft. above sea level—the total incline being 1,831 ft.—the line was opened for traffic in 1863. Considerable trouble is experienced with falls of rock and subsidences of the culverts and bridges. Watchmen are stationed every quarter mile day and night and there is always some repair work going on. From Karjat we returned to Bombay by the up Poona express. Anyone visiting Bombay should not fail to make the trip to Poona and see these wonderful works, which rank among the most marvellous in the world."

The Stronach-Dutton Loco. Tractor.

INVENTED some years ago by Major F. Dutton, Superintendent of Motor Transport in South Africa, this tractor is designed to utilise the low tractive resistance of vehicles running on rails and the high tractive effort of solid rubber tyres on roads. The loco-tractor has been in operation for several years past on a temporary track at Canada Junction, just outside Johannesburg. When it got to work instructions were given that the test should be as severe as possible, and grades and curves were accordingly incorporated which were more severe than would be required in actual practice. In discussing the system, Sir William Hoy, General Manager, Union of South Africa Railways, said that "its inventor has not yet succeeded in converting the technical advisers of the Administration to accept all that is claimed for it; but I am of opinion that the principle of the system is sound and desire to see it tried in a suitable district for the actual conveyance of public traffic."

A view is reproduced on the opposite page taken at Canada Junction, near Johannesburg, at the time of an official inspection by Sir William Hoy (who is seen near the second wheel with his left hand showing) and other officers of the railway organisation. Major Dutton, the inventor of the tractor, is seen on the extreme left of the picture. Other persons in the group include Mr. W. H. Barrett, Assistant General Manager (Transportation Department); Colonel Cresswell Clarke, C.M.G., O.B.E., Assistant General Manager (Transportation Department); Mr. A. M. Tippett, M.Inst.C.E., Engineer-in-Chief; and Mr. A. J. Beaton, M.Inst.C.E., C.M.G., Assistant Engineer-in-Chief.

Major Dutton has joined forces with General Stronach for the purpose of commercially exploiting his invention: as to

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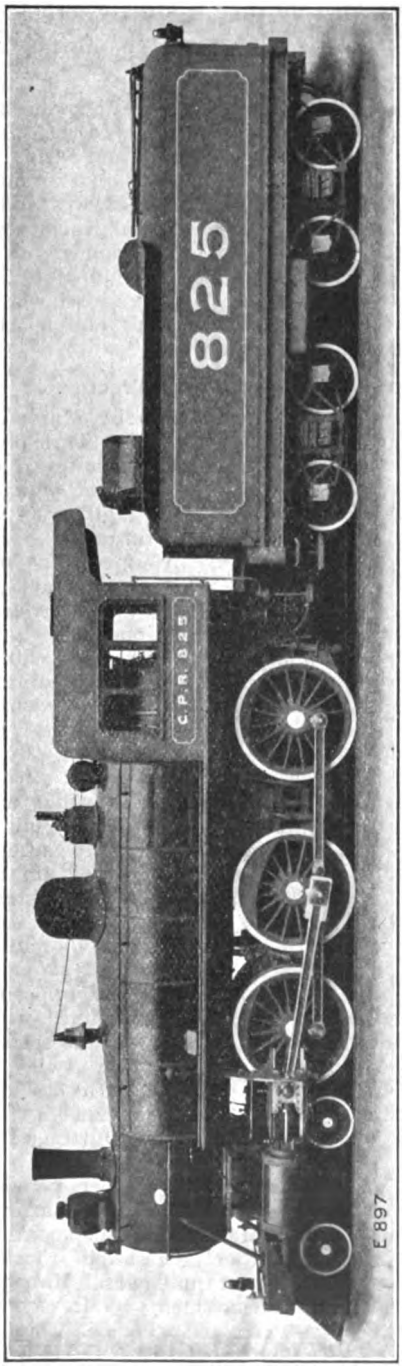

4-6-0 TYPE LOCOMOTIVE, CANADIAN PACIFIC RAILWAY.
Built by the North British Locomotive Co., Ltd., in 1900.

the advantage of which in a spacious and sparsely populated country like South Africa there can hardly be two opinions. To that end offices have been taken in London and the Roadrail Loco-Tractors Limited (Stronach-Dutton patents), are already at work making arrangements to hold a demonstration at an early date, probably in the vicinity of Aldershot.

British Locomotive Building for Abroad.

ALTHOUGH a large percentage of the engines built by British locomotive building firms are designs based upon British practice, as in the case of so many South American, Indian and various foreign lines, it is by no means unusual for them to work to drawings and in accordance with standards which are vitally distinct from home methods. Thus, taking the records of the three firms now incorporated in the North British Locomotive Co., Limited, we note quite a number of engines which include all the characteristics and which were built in accordance with drawings supplied from countries where practice was and is distinctly foreign to our ideas. As long ago as 1871 some 4-4-0 engines were supplied to the Grand Trunk Railway of Canada, which included all the features associated with locomotive practice at that time, including an enormous spark-arresting smoke stack in view of the use of poor fuel. And more recently, though now some 20 years ago, a number of 4-6-0 engines were built for the Canadian Pacific Railway, equally national in design and appearance. One of these engines is illustrated.

During recent years, and especially to meet the demands of the war period, quite a number of engines were built for French railways, and we illustrate a big four-cylinder compound superheater 4-6-2 engine supplied to the French State Railways. Other locomotives built to French drawings include 2-8-0's for the State lines, 4-6-0 and 2-8-2 T for the Paris-Orleans Railway.

Electric Rolling-Stock, London & South Western Railway.

IN order to cope with the congestion on its electrified suburban lines during the busy hours of the day, the London & South Western Railway has placed in service a number of new "trailer" cars, thereby adding considerably to the carrying capacity of each train.

In order to increase the capacity of each train, while not going to the expense of new motors and control gear such as would be required in the construction of a complete unit, it has been decided to add to each double unit train two trailer coaches placed between them. These new trailers are of

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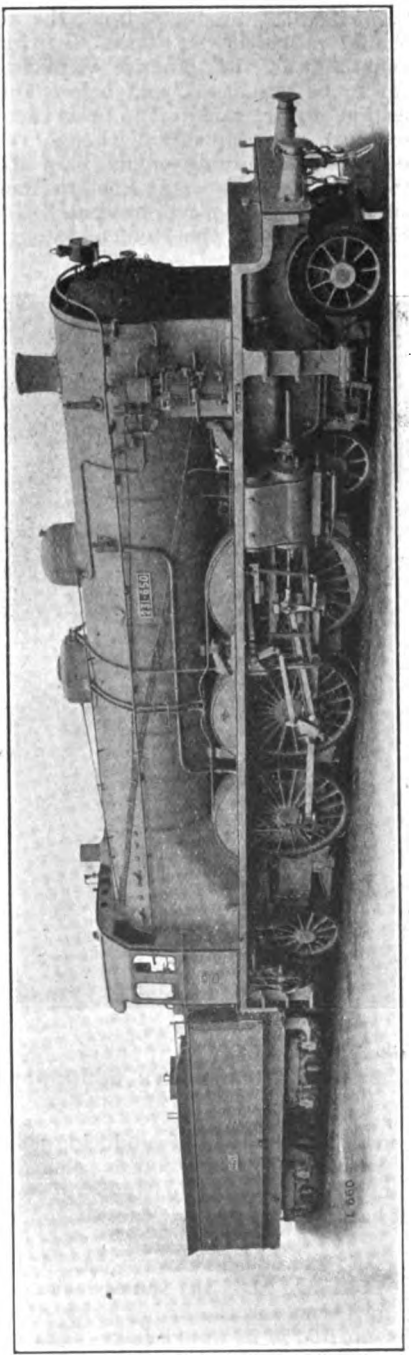
the usual bogie type similar to those already in use on the electrified lines, except that they are close coupled together in pairs, and at each end of the pair there are spring buffers similar to those on the motor coaches. They also differ from the existing trailers in that the control cables are carried along under the roof of the carriage instead of under the floor. Connection is made by the usual type of plug box with the motor coach at each end, and the cables are run to the top of the carriage and looped at the other end across the close coupling, so that the multiple unit control is obtained as hitherto. Unless there is a considerable amount of shunting these two trailers can only be used in conjunction with the two-unit train, since they are not provided with a driver's compartment or any form of control gear.

It is apparent that at the times of congestion each train consisting of eight coaches, instead of six, will have a considerably increased carrying capacity, while during the quieter hours the three-coach train will be run as at present. The London and South Western Railway are to be complimented upon having devised a comparatively inexpensive but effective way of meeting the congestion on its suburban lines.

During the busy hours each train is, therefore, now generally composed of two units and two trailer coaches in the case of the Kingston roundabout (Waterloo to Waterloo, via Kingston) service, and, in order to indicate to the motormen where the new 8-coach trains (2 unit and 2 trailer-coaches) should stop small boards bearing the figure "8" have been erected at the suburban stations concerned.

Oil Fuel for Locomotives.

In view of the high cost of coal and the difficulties of supply, it is not surprising that oil fuel is being extensively tried. And, as so often occurs, when a particular phase of engineering is brought before public notice, the general press have hailed the adoption of oil fuel for locomotive engines as if it were something new and progressive in itself. Oil has, however, been used for locomotive engines on a very large scale for at least fifty years in countries where oil is plentiful, particularly in Russia and parts of the United States, while it is about thirty years since Mr. J. Holden, Locomotive Superintendent of the Great Eastern Railway, introduced his apparatus, which was also adopted experimentally on many other railways, and systematically on foreign locomotives in the Dutch Indies and other places in the oil areas.



4-6-2 COMPOUND LOCOMOTIVE, FRENCH STATE RAILWAYS.
Built by the North British Locomotive Company, Limited.

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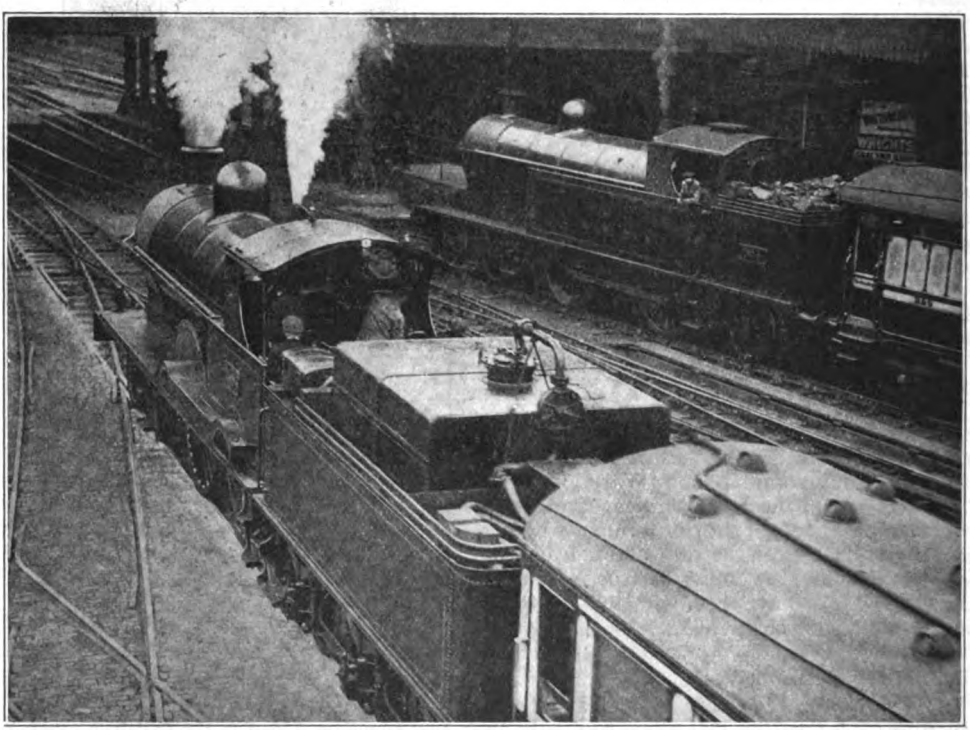
The Holden system was devised to enable either coal or oil to be used, and its primary object was to find a use for what were then regarded as waste products from the oil gas plants provided for train lighting. Unfortunately, as the practice extended, fuel had to be purchased, and before long the question of price caused it to be as cheap to use coal. Consequently, though we believe a few oil-burning engines are still in service, even on the Great Eastern Railway oil had to give place to coal; but, as already mentioned, the Holden system is still used in some of the oil-producing areas of the world, and where oil is plentiful, though not in all cases on the Holden system, oil fuel has been for many years in general use.

Many of the home railways tested the Holden system, and in some, instances, had it not been for the rising price of oil there is no doubt it would have been extensively adopted.

The New Oil Fuel Era.

OWING to the present fuel situation oil is being experimented with anew on a considerable scale, especially in France, Italy, and parts of South America, in consequence the high cost of coal, and, in many instances, of the difficulties of obtaining sufficient supplies. Further experiments are also in progress on some of the home lines, and in the case of the London and North Western Railway an exhaustive series of tests has been carried out with apparatus designed by the Scarab Oil-Burning Company, Limited. In May last 4-4-0 locomotive No. 2585 *Watt* ("Precursor" class), designed by the late Mr. George Whale, and built at Crewe in the year 1906, left the Bow Works previously the locomotive headquarters of the North London Railway, after being equipped with the Scarab oil-burning apparatus. It has since completed a relatively long mileage with various classes of trains, and on September 1 a demonstration run from London to Birmingham and back was made, to which a number of railway mechanical engineers, oil burning experts and others were invited. The engine was attached to the train leaving Euston at 11.30 a.m. on the outward journey, returning with the 4,50 p.m. train from Birmingham. The run was organised by the chairman and



Daily Mail copyright.] [*Per Topical.*

L. & N.W.R. LOCOMOTIVE BURNING OIL FUEL, SHOWING OIL TANK ON TENDER.

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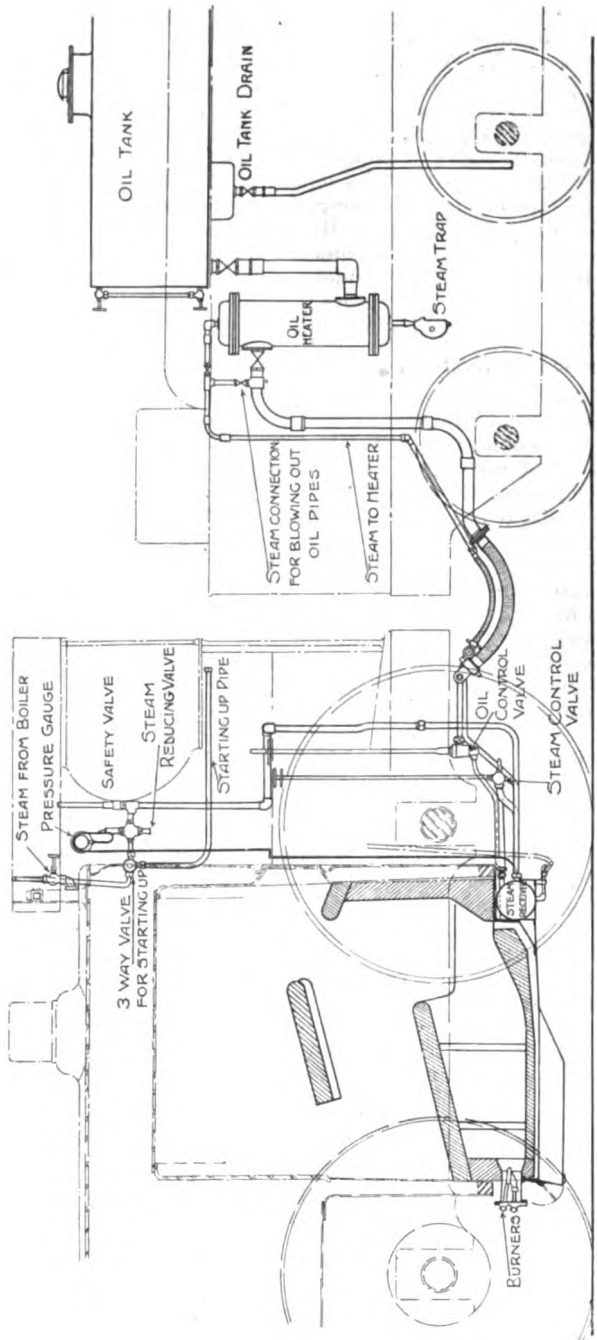
directors of the Scarab Oil Burning Company, Limited, of 28, Charles Street, Haymarket, W., and the London and North Western Railway Company kindly provided a directors' saloon and observation car for the conveyance of the visitors. The train, which was made up of nine vehicles, including one 12-wheeled dining-car and the directors' saloon, weighed, according to official figures, about 287 tons, and with this load the engine easily improved upon the working schedule, which latter, with a 6 min. stop at Coventry, allows 2½ hours for the run of 113 miles. On the uphill pull to Tring the absence of smoke from the chimney of the locomotive was generally remarked, 4 min. being gained on the 31½-mile run to that point on a ruling gradient of 1 in 332. Coventry was reached at 1.21 p.m., *i.e.*, 6 min, before time, and Birmingham at 1.55 p.m., or 5 min. early. The locomotive appeared to have the train well in hand at all points, and we learnt from Mr. Dingley, the company's Running Superintendent, who travelled on the footplate, that everything worked in a highly satisfactory manner throughout the trip.

Similarly, on the return journey, time was made up with a train of similar proportions. The 4.50 p.m. from Birmingham, New Street to Euston, stops at Coventry, Blisworth and Willesden Junction, and is allowed 2½ hours, inclusive of these stops, for the trip. On the demonstration run it arrived in London at 7.15 p.m., or 5 min. early, being in front of its time at most points on the journey, whilst necessarily observing the proper starting times at the stations called at, and always having a minute or so in hand; indeed, had there been no stop at Willesden it is probable that an even earlier arrival at Euston would have been effected.

Mr. C. J. Bowen Cooke, C.B.E., Chief Mechanical Engineer, London and North Western Railway, was unable to be present through illness, but the party included the following well-known railway officers:—Captain Hewitt Beames, Works Manager at Crewe and Chief Assistant to Mr. C. J. Bowen Cooke; Sir Vincent Raven, K.B.E., North Eastern Railway; Mr. H. N. Gresley, C.B.E., Great Northern Railway; Mr. W. Pickersgill, C.B.E., Caledonian Railway; Mr. R. H. Whitelegg, Glasgow and South Western Railway; Mr. W. Chalmers, North British Railway; Mr. W. H. Pearce, Great



DRAWING SHOWING DETAILS OF LOCOMOTIVE FITTED FOR BURNING OIL FUEL, LONDON & NORTH WESTERN RAILWAY.

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Western Railway. The London and North Western Railway Traffic Department was represented by Mr. L. D. Parsons, Assistant to the Superintendent of the Line, and the Scarab Oil Burning Company, Limited, by their Chairman, Colonel F. R. McDonald; Manager, Mr. W. J. Marshall; Chief Engineer, Mr. J. E. Armstrong and other officials. The War Office, Admiralty, and Ministry of Transport were all represented, as were also the technical and lay press. The visitors further included the Hon. Philip Henderson, of Livesey, Son & Henderson; Mr. J. S. Tritton, of Rendel, Palmer & Tritton, Consulting Engineers; Captain H. R. Sankey, C.B., President of Institution of Mechanical Engineers; Commander Legate, R.N. (Admiralty), and others.

The Scarab System.

THE Scarab system was developed in Mesopotamia during the war, when difficulties connected with fuel for military needs had represented what was practically an insurmountable barrier. It has since been adapted to various classes of boilers and other uses, among them being that of oil burning in locomotive fireboxes. The Scarab burner belongs to that class of burner in which the oil is atomised by a jet of air or steam. The general drawing reproduced shows the disposition of the burners and of the oil and steam supply pipes, as applied to the locomotive No. 2585 of the London and North Western Railway. The burners are placed at the front end of the firebox, a special "ashpan" being arranged below the foundation ring. The flame is projected towards the rear end of the firebox and thence deflected towards the tube plate.

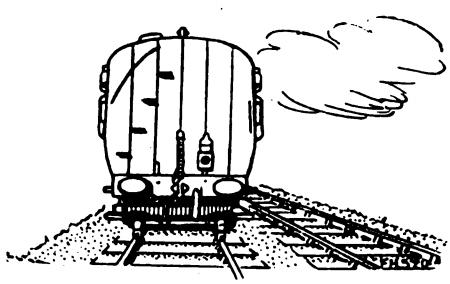
Three burners are installed and so connected to the oil and steam supply that the centre burner, the two outside burners, or all three burners can be used. Originally it was intended that with full load the three burners would be operating, but after some preliminary runs had been made it was found that best results were obtained with the centre burner only, and this burner was accordingly provided with a nozzle capable of dealing with up to 160 gallons of oil per hour. At the present time the outside burners are retained with their original capacity, but they are not used, even on maximum work, and will eventually be provided with nozzles of 20 gallons capacity and used as "pilot" burners when maintaining steam while the engine is standing.

A certain quantity of air is admitted through the burner casings themselves. Additional air enters through a damper placed below the firebox and is heated by its contact with the hot surfaces of the "ashpan" exposed to the flame. A considerable proportion of air passes to the burner by a passage provided immediately underneath the nozzle; a further portion enters the furnace through a number of small holes in the fire-brick false bottom of the "ashpan" a few feet in front of the burner nozzle, and the remainder of this air supply is allowed to pass into the furnace close to the back plate of the firebox, and having been highly heated on its way, is admitted to the furnace to provide the necessary oxygen to complete combustion of the highly atomised oil.

Steam for the oil burners for atomisation is taken from the steam mounting on the top of the boiler to a reducing valve set to deliver steam at 15 lb. pressure, which is conveyed to a receiver placed longitudinally in a space provided at the back of the "ashpan." A safety valve is provided on the low pressure side of the pipe line.

From the receiver steam is conveyed by pipe lines to the burners through regulating valves operated from the footplate. A connection for starting up the engine from cold by means of an auxiliary supply of air or steam is fitted in the cab. This connection is also fitted with a pipe leading from the blower ring in the smokebox for creating a draught when starting up.

The average oil consumption of 32 lb. per mile compares most favourably with the coal consumption of 70 lb. per mile of this engine when using coal as fuel.



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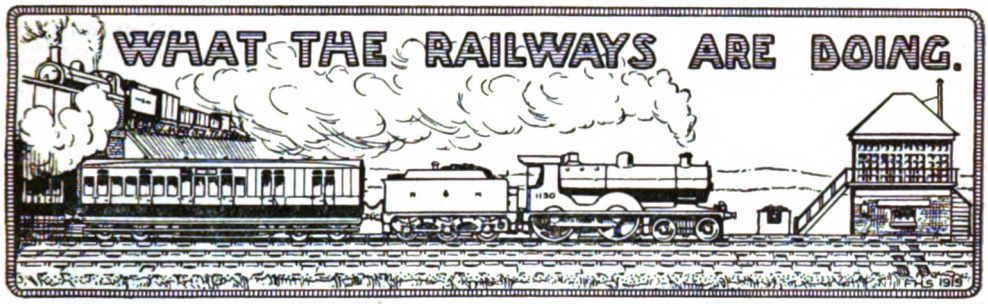

As announced in the August RAILWAY MAGAZINE, Lieut.-Col. A. S. Redman, C.B., R.E., M.Inst.T., has succeeded Mr. G. H. Eyre as Traffic Superintendent of the Somerset & Dorset Joint Railway. Lieut.-Col. Redman was educated at Repton and afterwards underwent three years' training at the Indian Engineering College, Cooper's Hill. He was about to take up an appointment on the Indian State Railways when he was offered and accepted a direct commission in the Royal Engineers, which he joined at Chatham in 1901. He received his first experience in railway working on the Great Western Railway, and has since been employed at home and abroad on duties in connection with various branches of engineering and railway work. During the war he was concerned with the work of military traffic over the railways, and the many problems arising therefrom. Recently Colonel Redman was Deputy Director of Railways at the War Office, dealing with the varied problems connected with the railways abroad which are under military administration, and the home railways in so far as the War Office is concerned; as well as latterly being in charge of the work of closing the Inland Waterways and Docks Directorate.

LIEUT.-COL. A. S. REDMAN, C.B., R.E.,

Traffic Superintendent,
Somerset and Dorset Joint Railway.

* * *

MR. G. H. EYRE, who has retired from the position of Traffic Superintendent of the South Western & Midland Railway Companies' Somerset & Dorset Joint Line, has seen 55 years' railway service. Mr. Eyre commenced on the Midland at Oakham, and after experience there, and at Masboro', Sheffield and Kentish Town, was attached to the office of the Superintendent of the Line at Derby, and relieved at most of the important stations on the system. Subsequently he was District Inspector between Syston and Lynn, and was sent to Bath as Chief Inspector of the Joint Line in 1876, when the two leasing companies decided to take over the working of the line themselves—it had hitherto continued to be worked by the old Somerset & Dorset Company. He subsequently became Assistant Superintendent, and on the retirement of Mr. R. A. Dykes in 1902, was appointed Superintendent. Mr. Eyre's work at Bath is practically the history of the Somerset & Dorset Joint Railway for the last 44 years.

* * *

MAJOR ERIC W. ROSTERN, M.C. (only surviving son of Mr. Joseph Rostern, C.B.E., Chief Goods Manager, Great Central Railway), who has been engaged as Railway Adviser on the staff of the Inter-Allied Administrative Commission, has now returned to this country, and has resumed at Doncaster his former position of Assistant District Traffic Manager of the Great Central Railway (Northern Division).

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A COMMITTEE of General Managers has been appointed to deal with questions affecting rates of pay and conditions of service of railway employees. Mr. H. E. O. Wheeler, Great Western Railway, has been made Secretary to the Committee, with offices at 16, Great George Street, Westminster, S.W. 1. For some years past Mr. Wheeler has been on the staff of the General Manager of the Great Western Railway. He joined the service in the Rolling-Stock Department at Wolverhampton in 1892, being subsequently transferred to the Traffic Department. In 1899 he entered the General Manager's office, where he has been since engaged. In 1912, he was placed in charge of the conciliation section and subsequently of the whole of the staff work, being appointed as Secretary of the company's side of the Conciliation Boards and Staff Conferences.

* * *

MR. EUSTACE J. MISSENDEN, who has succeeded Mr. H. E. O. Wheeler as London District Traffic Superintendent, South Eastern and Chatham Railway, entered the service in 1899, and after several years' training in station working, was transferred to the office of the Superintendent of the

MR. EUSTACE J. MISSENDEN,

Appointed London District Traffic Superintendent, South Eastern & Chatham Railway.

Line in 1906. After gaining experience in several departments, Mr. Missenden was appointed Assistant to the District Superintendent, Eastern Division, in 1912, and in 1914, was transferred to London as Assistant to the London District Traffic Superintendent. Mr. Missenden has been acting London District Traffic Superintendent during the past year in the absence of Mr. H. E. O. Wheeler, acting as Assistant Superintendent of the Line.

MR. H. E. O. WHEELER,

Appointed Secretary to the Committee of General Managers dealing with rates of pay and conditions of service of railway employees.

AT an officers' conference (Traffic Department) held at Paddington a presentation has been made to Mr. J. A. Robinson (until recently Chief Outdoor Assistant to the Chief Mechanical Engineer, Great Western Railway) of a gilt vase. Since his retirement, Mr. Robinson has joined the firm of J. & P. Hill, Ordnance Works, Sheffield. Mr. Chas. Aldington, C.B.E., General Manager, G.W.R., made the presentation on behalf of the conference. Mr. Robinson supplemented his thanks for the honour bestowed upon him by giving some account of his early experiences in the course of which he remarked :

"I commenced at Chester, firing from that place to Hereford and Birmingham. Later on I came to Wolverhampton to finish my apprenticeship in the works under Mr. Simpson's father. I left there when I was 21 years of age, and when we took over the Bristol and Exeter Railway. A good many of you will remember, when we took over that line, and in the Bristol and Exeter days there were no diagrams at all ; they had very good engines, but no diagrams. I was

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selected by Mr. Joseph Armstrong to teach the Bristol and Exeter men the Great Western locomotive work, and I had a rough job. I had already performed a great deal of work on the narrow-gauge and a good deal on the broad-gauge.

MR. EDWARD J. GLAYZER, M.B.E.,

Chief of Police,
Great Central Railway.

"When I was in the North we had no special instructions as to incline working. We were told to use every precaution in descending inclines, and I remember coming down a bank with engine No. 125, when I was a fireman, and had to go over the top of the first six wagons and put down sufficient brakes. We pinned down additional brakes for wet weather and on very hot summer days. We once ran down the Gresford bank, with our engine reversed, at a terrific speed, and stopped only 150 yards off Holyhead Junction. In those days there were not four lines from Saltney Junction into Chester, as now. That incident taught me a lesson, namely, that on hot days more brakes were required to be pinned down.

"During the whole of my career with the Great Western I have seen a good many changes, but I was always glad that I had a fireman's experience, and I do think that if you want to get the best out of an engineman or fireman you have got to speak to him in his own language."

MR. EDWARD J. GLAYZER, M.B.E., who has been appointed Chief of the Great Central Railway police, with headquarters at Nottingham, commenced his career with the Metropolitan Police Force at the foot of the ladder; step by step he rose until he attained the highest position then open to the rank and file, that of superintendent. He had charge of the "P" Division, one of the largest divisions in the Metropolitan Police area, with a force of over a thousand officers and men. He was a member of the Disciplinary Board at Scotland Yard appointed by the Chief Commissioner of Police.

* * *

BRIGADIER-GENERAL HUGH DRUMMOND, Chairman, London and South Western Railway, in opening the annual vegetable, fruit and flower show at the Brunswick Institute, Vauxhall, recently, said that more than 7,000 South Western railwaymen devoted their leisure to cultivating these plots. The directors of the railway did everything possible to encourage gardening among the staff with the object of assisting to maintain the nation's food supply. The company bought in bulk the best seeds procurable for disposal among the staff, who this year applied for and planted no less than 80 tons of seed potatoes.

* * *

THE Londonderry correspondent of the *Daily Telegraph* reports that a sensational affair occurred at Drumbat Halt on the County Donegal Railway recently. When the train arrived at Drumbat, 10 masked armed raiders entered the guard's van, while another raider ordered the engine driver and fireman off the engine, covering them at the same time with a revolver. Mr. Henry Forbes, Secretary and Traffic Manager, who was travelling in the train, witnessing the incident, crept along the carriages to the engine and opened fire on the raider who was holding up the driver and fireman, ordering him at the same time to put up his hands. The raider, having put up his hands, fled to the waiting room, where he returned fire at Mr. Forbes. Meantime the other raiders, who were ransacking the mails, fled across a field, firing at Mr. Forbes, who pursued them. Mr. Forbes succeeded in capturing one raider who had fallen. He brought him to the train at empty revolver point, and conveyed him to Londonderry police barracks. Although the train was crowded no one went to Mr. Forbes' assistance.

* * *

THE Institute of Transport has been registered as a company, limited by guarantee,

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not formed for the purpose of profit. The number of members is unlimited and each member is liable for not more than £1 in the event of winding-up. The objects are: To promote and encourage knowledge of traffic science and the art of transport, and the means and appliances connected therewith, to provide facilities for study and the exchange of ideas, to grant certificates, medals, diplomas and scholarships, &c. The income and property of the Institute is to be applied solely towards the promotion of its objects, but payment in good faith of interest, at not more than 5 per cent., on any loans advanced by members to promote the objects of the Institute, is permitted. The Institute is to consist of members, associate members, graduates, students and honorary members. Members and associates only are to be "members" for the purposes of the Companies Acts.

* * *

ALWAYS a popular event, the 28th Summer Athletic Meeting of the London and North Western (London) Athletic Club, held on Saturday, September 11, at Wembley, was the occasion of a great gathering of enthusiastic members and friends. For the first time a section of the ground was utilised for the annual show of the London and Southern Division of the London and North Western Railway Horticultural Society. A lengthy programme of athletic events was carried through with admirable punctuality, and some interesting performances were put up. Three marquees were devoted to the Horticultural Society's show, and here a large number of interesting exhibits were on view. Lady Williams, who was accompanied by Sir Thomas Williams, General Manager, distributed the prizes for both sections, accompanying each distribution with a few kindly words. Mr. G. N. Ford, O.B.E., London District Superintendent, as president of the Horticultural Society, introduced Lady Williams, and after the presentation had concluded, Mr. W. E. Bradbury, M.B.E., chairman of the committee, expressed the thanks of the gathering to Lady Williams and to Sir Thomas Williams for their presence and assistance. Mr. C. F. Graseman, Assistant to the General Manager and Chairman of the General Council of the Athletic Club, after the prizes had been presented for the sports events, with his usual felicity called for cheers for Lady Williams and Sir Thomas Williams, which the latter, in a short speech, acknowledged in appreciative terms, expressing the pleasure both he and Lady Williams always had in attending this well-known function. Once again we have to congratulate Mr. C. F. Graseman and the members of the General Council of the London and North Western (London) Athletic Club, and the many officers of the company who assisted in various ways, on a well-organized and successful meeting.

* * *

THE committee of the Great Eastern Railway Musical Society have arranged to receive applications for junior members of the railway staff desirous of being trained in playing orchestral instruments. Good instruction will be provided and suitable instruments, where necessary, will be lent. Mr. A. W. Headley, Hon. General Secretary, Chief Mechanical Engineer's Department, is the recipient of the applications from the staff.

* * *

THE London & South Western Railway announces that compartments may now be reserved in certain trains from Waterloo. A registration fee of 5s. for each compartment will be made, and intending travellers must hold four first or eight third-class tickets to obtain the facility. Further particulars can be obtained from the Stationmaster at Waterloo Station.

* * *

ON the North Eastern Railway, Flying Hall and Spennithorne stations were reopened on September 18. All passenger trains on the respective branches stop at these stations except the following:—Flying Hall: 6.25 p.m. from Scarborough to Whitby. Spennithorne: 10.50 a.m. and 7.10 p.m. from Northallerton to Hawes Junction, and 6.25 p.m. from Hawes Junction to Northallerton.

* * *

REFERENCE was made recently to gradients easier than 1 in 6,600 definitely indicated by gradient boards, and several readers write to point out that between Wimbledon and Raynes, on the London and South Western main line, there is a gradient post marked 1 in 11,000 towards Wimbledon and 1 in 13,230 towards Raynes Park.

* * *

BY the courtesy of the Great Western Railway, the Railway Club has paid a visit to the Signal Works at Reading, where a very interesting afternoon was spent. The party was shown through all the shops, and inspected several large locking-frames in course of erection; much interest was also taken in a number of examples of cab-signalling apparatus. This expedition concludes the outdoor summer functions of the club. On Friday, September 10, the autumn session began with a paper by Mr. Lionel Hiller (of Tyer & Co.) on "English and

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French Signalling Compared"; the lecturer exhibited a number of models of apparatus in use in both countries. With this meeting the Railway Club inaugurates its new and more commodious premises at 65, Belgrave Road, S.W.1; a very welcome feature is the provision of a fine lecture room in the same building. The Committee have arranged a strong programme for the winter months; all the papers to be given deal with matters of present-day railway politics. At the request of a number of members the meetings, which are now arranged for the second Friday in each month, will commence at 7.30 p.m.

* * *

DUTIES given to engines of special designs, particularly where there is only one of the class, frequently give rise to queries which the rules of our "Why and the Wherefore" pages preclude us from answering, especially as those duties are frequently changed ere a reply can appear in print. One of our readers, Mr. K. Paton, mentions, however, a turn frequently worked by South Eastern and Chatham Railway 2-6-4 tank engine No. 790 which may be of interest: 3.45 a.m. Cannon Street to Folkestone Junction (parcels, &c., train), 8.16 a.m. Folkestone Junction to Cannon Street, 4.18 p.m., Cannon Street to Dorking, light Dorking to Redhill, 6.12 p.m., Red Hill to Tonbridge, 7.40 p.m., Tonbridge to Cannon Street. Mr. Paton also mentions that Nos. 811 and 812, new 2-6-0's, are now in service.

* * *

A CANADIAN INFORMATION BUREAU has been opened at the offices of the Canadian Pacific Railway, 62-65, Charing Cross, London, S.W.1; the Bureau has been established to provide a source from which trustworthy information of every description relating to Canada and Canadian affairs may be obtained without difficulty. The librarian of the extensive reference library is in daily attendence.

* * *

A FURTHER relaxation in the passport arrangements for visiting Italy is announced by the London Office of the Italian State Railways. British and American subjects can obtain from any Italian Consulate a visa for six months available for any number of journeys to and from Italy within that period without any further formalities. This, with the French yearly visa, now renders matters very simple for visiting Italy. Having obtained these two "period" visas travellers need not visit any Consular Offices (French, Italian or British) either before starting for Italy or before returning from Italy to this country through France, however many journeys are made to and from Italy during the period of validity of the visas. The fee for this new visa is the same as for the old single-journey visa, *i.e.*, 8s.

* * *

IN Australia increased railway interstate fares came into operation in July. It is pointed out by the Railway Department that the increases amount to about 14 per cent. all round. This will tend to make them more uniform with the increased rates charged over the Victorian and Queensland railways. The recent increases in the interstate steamer traffic have also been a factor in the revision of the New South Wales railway rates. As an instance of the effect of the increases, it may be remarked that the railway fare from Sydney to Melbourne will be £4 (first class) and £2 13s. (second class) from July 1, as against £3 10s. and £2 7s. respectively at present. A corresponding increase in the return fares for holiday excursion traffic is made, bringing them to £6 13s. 6d. (first class) and £4 9s. (second class). The new ordinary fares between Sydney and other State capitals are:—

	First.	Second.
	£ s. d.	£ s. d.
Sydney to Adelaide	6 5 0	4 3 0
Sydney to Fremantle or Perth	13 4 0	8 16 0
Sydney to Brisbane	4 4 0	2 16 0

Comparative increases will be added to the fares from all stations. Similarly, the charges for interstate periodical railway tickets have been raised in the same proportion. New parcel rates and charges for luggage, on the same basis of increases, will be charged. Another innovation is that children up to four years of age will be carried on the interstate lines free. The age limit on these lines has been three years. It will now be four years, and will thus be uniform with the bylaws operating throughout interstate traffic.

* * *

IN connection with the Canadian Pacific Railway the twin-screw geared turbine passenger liner *Empress of Canada*, which is being built to run under the management of the Canadian Pacific Ocean Services in the Canadian Pacific Mail and Passenger Service between Vancouver, Japan, China and Manila, has been successfully launched from the yard of the builders, the Fairfield Shipbuilding and Engineering Co., Ltd., at Govan, Glasgow. This vessel, which is the largest liner yet built by the Fairfield Company, will also be the largest mail and passenger steamer running on the Pacific, and, with the well-known liners, *Empress of Russia*, and *Empress of Asia*, retain for the

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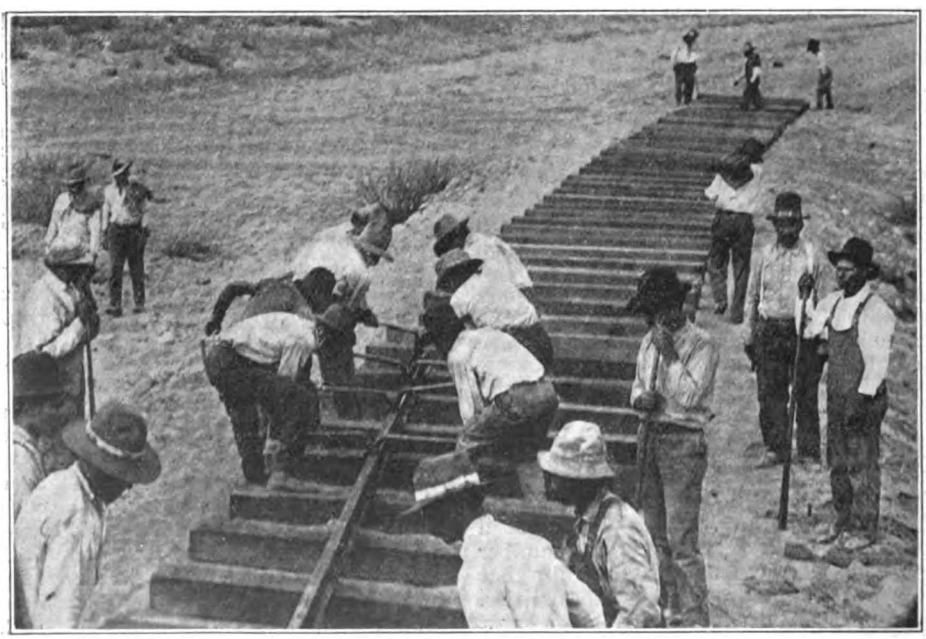
C.P.O.S. and the British Empire, the quickest and finest service on the Pacific. After completion the *Empress of Canada* will make a world tour on her way to Vancouver, passengers travelling by Canadian Pacific round the world. The ship is scheduled to leave Liverpool in March, 1921, and will proceed via Gibraltar, Monaco, Naples, Suez—through the Red Sea to Bombay, Colombo, Singapore, Batavia, Manila, Hongkong, Shanghai, Kobe, Yokohama. At each port time will be given for visits to important places of interest within easy distance, and arrangements will be made to enable travellers to spend their time to the best advantage.

THE lectures and classes on railway and transport subjects conducted by the London School of Economics and Political Science are highly regarded in railway circles, and in consequence of important developments, recently completed, an even more notable programme is available for the 1920-1921 session. During the Michaelmas term, commencing October 5, Mr. Philip Burtt, formerly Deputy Manager of the North Eastern Railway, will conduct classes on "Railway Operating," "Railway Rate Making" and "Railways in Relation to the State"; Mr. W. Tetley Stephenson will deal with "Commercial Railway Economics," "General Economics of Transport" and "Operating Railway Economics"; Mr. W. Valentine Ball, O.B.E., M.A., covers the "Law of Carriage of Railway"; and Professor A. L. Bowley, Sc.D., F.S.S., has classes on "General Statistics." Some of these are continued during the Lent and Summer terms, and Mr. Stephenson will also cover "Organisation of Transport," "Railway Statistics," "Railway Rates and Fares" and "Economics of Transport," while Mr. Burtt will, in addition, deal with "Ports and Docks" in the Lent term. Full particulars can be obtained on application to Sir William H. Beveridge, K.C.B., Director, at the offices, Clare Market, Portugal Street, Kingsway, W.C.2.

TRACK-LAYING IN MEXICO.



MEXICAN WORKMEN LAYING TRACK ON THE SAN DIEGO & ARIZONA RAILWAY.

A new line connecting California with Arizona and passing through a section of Mexico hitherto not provided with railway facilities. (*See also page* 230.)

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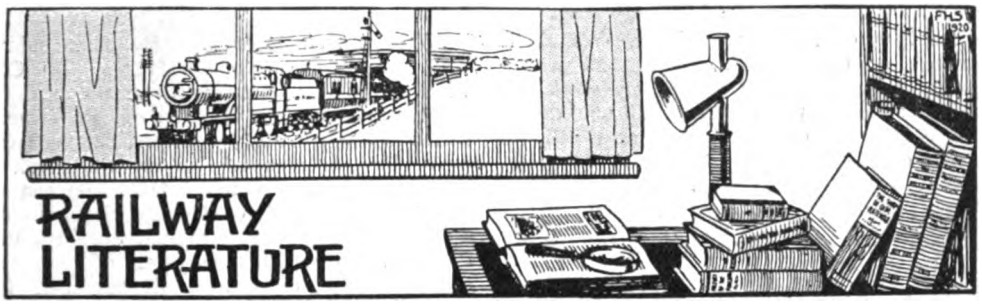

THE RAILWAY GAZETTE: SPECIAL WAR TRANSPORTATION NUMBER. [Transport (1910) Limited, Queen Anne's Chambers, Westminster, London, S.W.1. Price 5s. net.] During the war and since the Armistice in November, 1918, a considerable number of RAILWAY MAGAZINE readers have expressed the wish that a book should be published recording and illustrating the work of the Directorate of Movements and Railways in the various theatres of war. The privilege of producing the first connected account of war transportation developments has been accorded to the *Railway Gazette*, and the particularly excellent special number under notice is the result.

With every facility afforded by the authorities the compilation of this special number must have been an enormous task, but the completed work provides ample evidence of very careful and painstaking methods of production. Transportation, as evolved during the great war—and particularly the railway share thereof—was a mammoth enterprise, far exceeding anything previously attempted in the annals of human endeavour, and to place on record, with due regard to proportion and importance, the outstanding features of such immense and multitudinous developments has been an undertaking of no mean order. It has become a commonplace assertion that whatever was muddled through during the war, railway transport certainly was not, but on the contrary the railway industry earned the highest praise for its skilful and successful handling of the vast and intricate transport problems by which it was assailed throughout the great conflict. In a minor key the same measure of approbation must be accorded the well-illustrated budget of war transport activities now under review, and the RAILWAY MAGAZINE can confidently recommend the acquisition of a copy by everyone interested or concerned, or who had part or lot, in any kind of transportation achievements during those many fateful, anxious and often agonising months, comprised within the nearly five years of the welter of war that began in August, 1914.

The special number consists of 160 quarto pages, 52 of which are of illustrations on art paper. These latter, without exception, are of a striking character and quite in accordance with the spirit of the times—the age of pictures! Leading Editorials are :—

The Organisation of War Transportation.
Railway Material.
Statistics of War Transportation in France.
" The Mystery Port."
The Overland Route to the East.
Working of the Trans-Siberian Railway
Light Railways in War.
The Port of Basra.
Paris as a Military Railway Centre.
Railway Operations in Macedonia.
Railways and the Wounded.
Military Railways of Mesopotamia.
Railway Construction in Palestine.
Cross-Channel Train Ferry Services.
Railways and the Great War.
Railways and Foreign Politics.

Miscellaneous matters dealt with include :—

British Railways and the War.
Delays by King's Enemies.
Railway Facilities at Lille, Lens and Valenciennes.
The Value of Full and Accurate Statistics.
Railways in East Africa.
Captured Railway Wagons.
Description of Ferry Steamers.

In addition to the attractive photographic reproductions with which the special number is replete, mention must be made of the valuable plans and maps that are included, and a word of praise must be accorded the illuminating diagrams and charts that go far to explain and make easy of comprehension the more intricate statements embodied in the text.

Instructive and useful as this special War Transportation Number is to the student of transport questions of the present day and generation, one can but feel that in the years to come it will be in great request as an authoritative source of information on all that appertains to its subject. Future historians will glean from its pages

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much that otherwise would have remained obscure or unrecorded. In the meantime the publishers may be sure that the work will receive a hearty welcome from all who desire the possession of a succinct and reliable record of what was done in the way of transport during the Great War.

UNIVERSAL DIRECTORY OF RAILWAY OFFICIALS, 1920. [The Directory Publishing Company, Limited, Queen Anne's Chambers Westminster, S.W. 1. Price 20s. net.]

The 26th annual edition of this invaluable compilation is now published. All the standard features of previous volumes are retained, and no change is made in the style of the work. The indices, however, which hitherto have been placed partly in the front and partly in the rear of the volume, are now brought together following the section devoted to individual railways.

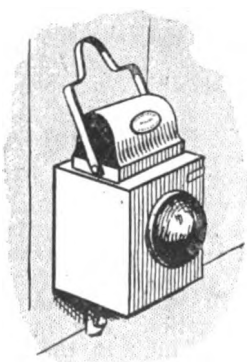
Owing to conditions involved by the return of American railroads from Federal control, many changes have occurred quite recently, and publication has been delayed to some extent in order that this important section might be essentially up-to-date in this respect. In the case of the Central Empires, Russia and some of the new countries, it has been impossible to obtain all desired information, but every effort has been made to ensure accuracy.

General particulars, together with the names of the directors and chief and district officers on a very complete basis in regard to virtually every railway in the world are given, while, in the case of railways in foreign countries, the name is usually given in the language concerned as well as in its English equivalent. The indices represent one of the most important features; these give reference to every person whose name appears in any capacity.

GEORGE STEPHENSON. By Ruth Maxwell, M.A. [George G. Harrap & Co., Limited. Price 3s. 6d. net.]

Included in the "Heroes of All Time" series issued by the publishers, this volume may be commended as a well-written presentment of the main facts concerning the life and work of George Stephenson. Necessarily only the principal episodes are covered, but within 192 pages of text the authoress has condensed all essential information and gives, besides, very good pictures of the conditions under which George Stephenson lived as a boy, of his early work as a colliery engineman, his invention of the safety lamp, and the building of his first locomotive. Attention is then given to the better-known events, the making of the Liverpool and Manchester Railway, the conquest of Chat Moss, etc. A frontispiece in colour, and eight other illustrations are included.

THE LOCOMOTIVES OF THE LONDON, BRIGHTON AND SOUTH COAST RAILWAY. By W. G. Tilling. [Price 2s. net.] While in no respect infringing upon the historical character of the book issued by the Locomotive Publishing Company, Limited, which bears a similar title, this volume should be distinctly popular with our readers. It provides a review of all locomotive classes now in service, nearly all being illustrated, while the frontispiece, showing No. 328, *Charles C. Macrae*, is in colour, together with the official classification, dimensions and a complete catalogue of the entire locomotive stock. It is well produced, and appears to be accurately compiled, while an unusual feature is a series of "Notes" pages at the end whereby individual readers can keep their records up to date, and space is provided for any further editions to be completed.



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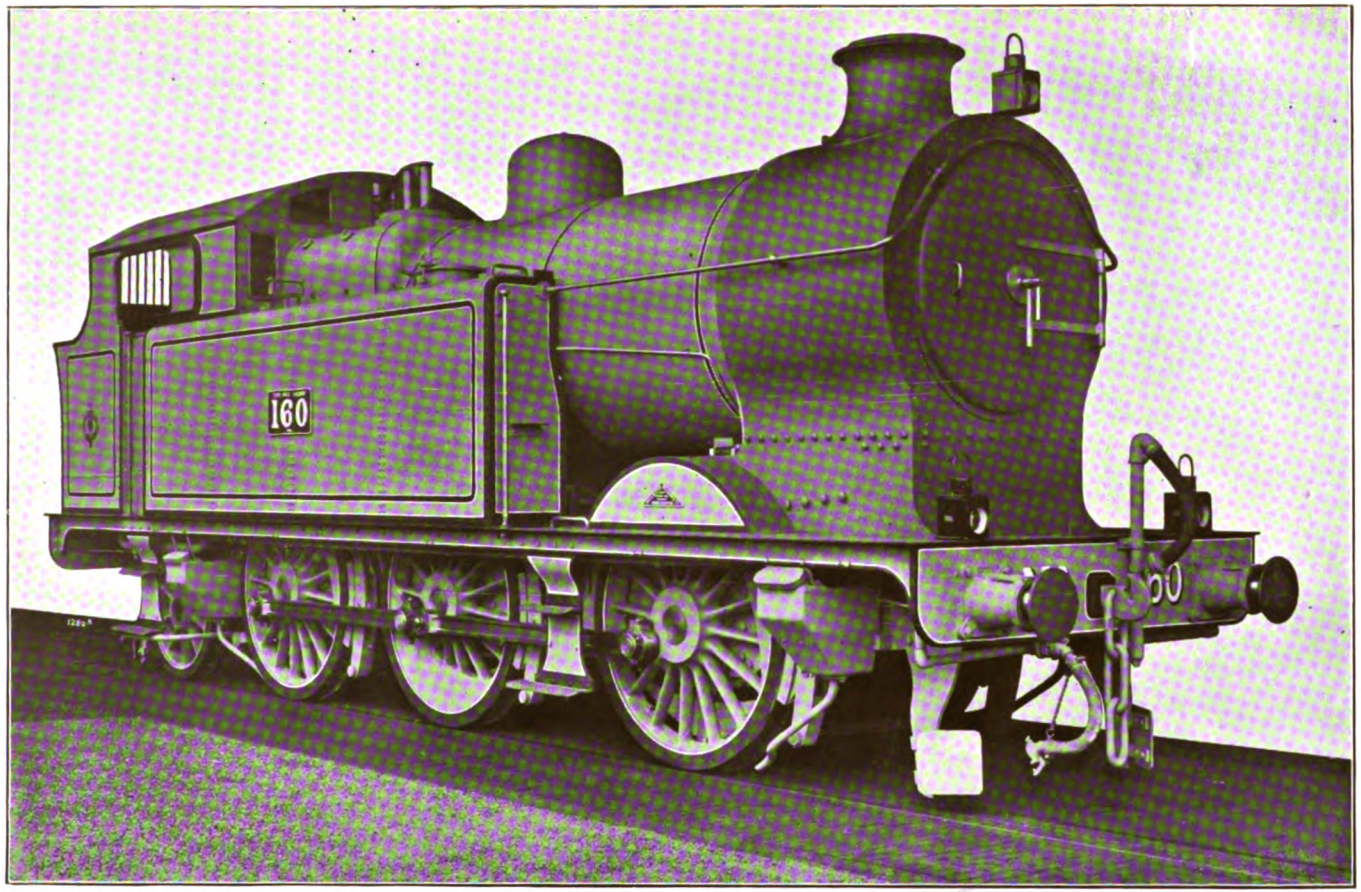

THE RAILWAY MAGAZINE.

0-6-2 TANK LOCOMOTIVE: TAFF VALE RAILWAY.

Locomotive Engineer, Mr. J. CAMERON.

Cylinders: 18½ in. × 26 in. Coupled Wheels: 5 ft. 3 in. diameter.
Heating Surface: 1,319 sq. ft.; Steam Pressure, 160 lbs. per sq. in.
Weight in working order: 69 tons 1 cwt.

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GENERAL VIEW OF STATION, FROM NORTH SIGNAL CABIN.

Notable Railway Stations and their Traffic.

EAST CROYDON,
LONDON, BRIGHTON & SOUTH COAST RAILWAY.

By J. F. GAIRNS.

A TOWN of 200,000 inhabitants, possessing ten railway stations within its corporate limits, and a principal shopping centre for a wide area, Croydon is necessarily of considerable traffic importance to the two railways serving it. But while West and South Croydon (London, Brighton and South Coast Railway) and Addiscombe Road (South Eastern and Chatham Railway), deal with a very appreciable proportion of the railway traffic of the town, East Croydon ranks as the chief of the four principal stations serving Croydon proper. It is, indeed, one of the five most important stations on the Brighton system, ranking with London Bridge, Victoria, Brighton and Eastbourne, for besides the traffic of Croydon itself, it is an important changing and connecting centre, while its goods traffic is considerable, and the northern district traffic, goods and engineering headquarters are there located, though in a building separate from the station premises. Adjoining the station are also the Fairfield workshops of the engineer's department.

The original London and Croydon Railway went to West Croydon: *viâ* East Croydon, the line was jointly owned with the South Eastern Railway as far as Redhill, to which station public traffic was inaugurated in 1841; but at an early date this section was divided between the two companies, East Croydon being included in the portion handed over to the Brighton Railway. It is, therefore, a purely Brighton station, but the South Eastern and Chatham Railway has not only running powers, but considerable rights of user of the station, nearly all South Eastern and Chatham Railway trains towards Purley and Redhill calling there. The only exceptions, indeed, are a few business fast trains which omit East Croydon because they are sufficiently loaded independently thereof.

South Eastern and Chatham Railway traffic at East Croydon, therefore, includes

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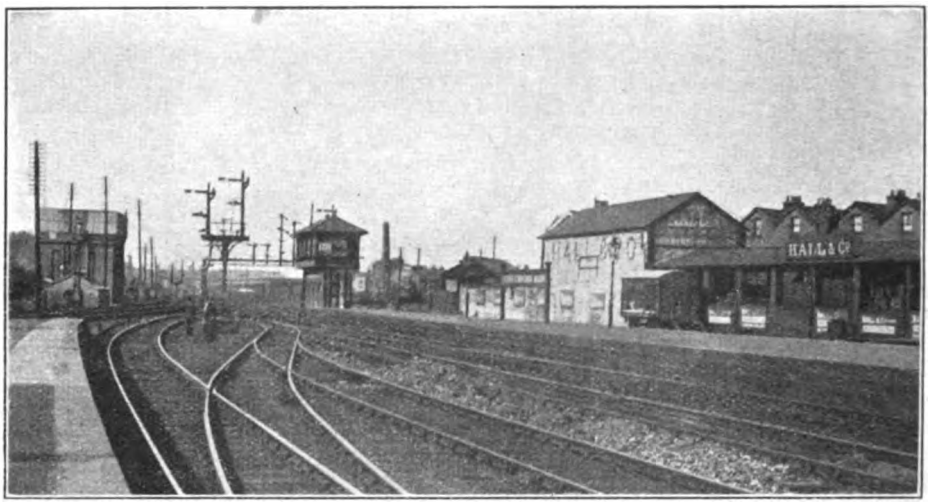

VIEW FROM No. 1 PLATFORM, LOOKING NORTH.
Showing North Box, and up starting and down home signals.

all services which pass that way, including the Redhill, Guildford and Reading, Caterham Valley, Tadworth and Tattenham Corner and Oxted line trains, together with certain long-distance trains travelling *via* Redhill. On the Brighton side, there are not only all the main line services, many important expresses calling at East Croydon, as well as trains of a semi-fast and main line stopping character, but also a considerable local traffic conveyed by suburban trains. The Brighton main line services include even those of the Portsmouth and associated routes, for several trains travel *via* Three Bridges and to some extent *via* Shoreham and Worthing, though West Croydon takes much of this traffic *via* Sutton. Local Brighton facilities at East Croydon also include rail motor trains between Crystal Palace and Coulsdon.

In the days when special "express fares" were charged by the main line trains, East Croydon was divided into two sections, that reserved for local trains being known as New Croydon; but for many years past any such distinction has been done away with, the island platform of the "New" station being referred to only as the "local" platform for purposes of distinction. For many years a few Great Eastern Railway local trains ran between Liverpool Street and East (or New) Croydon, but these were withdrawn prior to the electrification of the East London Railway. Indeed, except very occasionally, and then usually only for time-table purposes, East Croydon is no longer a terminal station for any trains, while of late years the number of trains combining or separating London Bridge and Victoria portions there has been very largely diminished. A standard principle of connecting trains is, however, widely adhered to, many main line and Oxted line trains being regularly scheduled for interchange purposes without change of platform, one train of each such pair coming from or running to Victoria and the other London Bridge. Except for London and North Western Railway and Great Western Railway engines on goods trains, there is now no regular foreign working to or through East Croydon, except for the South Eastern and Chatham Railway traffic which is a standard feature as already explained.

As showing the traffic importance of East Croydon station it may be mentioned that about 100,000 tickets are issued monthly. Besides this, however, the season ticket travel is very great, though, owing to the inter-availability of tickets issued at East Croydon, West Croydon and Addiscombe Road, and from the London stations of both railways, exact figures are not available. It is estimated, however, that between 4,000 and 5,000 seasons are in force, and East

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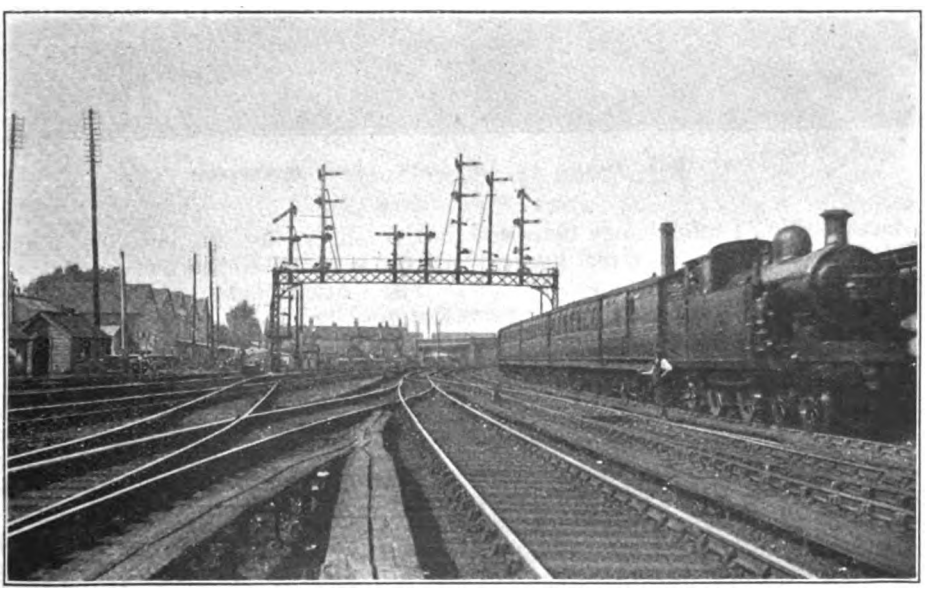
Croydon deals with by far the larger proportion of this traffic. By means of the local tramways and motor-omnibus routes the station is, indeed, convenient of access in many directions, so that passengers frequently reach the station in this way in preference to using a nearer station not so suitable for joining main line trains for the many seaside and holiday places served by the two railways concerned.

On the goods side East Croydon is an important centre, besides meeting the needs of a town of considerable size, a recognised shopping rendezvous, and which also accommodates several manufactories and industrial establishments. Milk traffic is a considerable factor, and about 400 churns are handled daily, besides that passing in complete van loads. Three special milk trains are made up at East Croydon in each direction daily, to go on by local distributing services, while the attaching and detaching of milk vans, as also of horse-boxes, carriage trucks, &c., add considerably to the work of the station. For these miscellaneous duties two pilot engines are regularly in service for most of the day, though one suffices for a few quieter hours.

The approaches to East Croydon from the north are somewhat complicated, but as these were described in the RAILWAY MAGAZINE for August last there is no need to discuss them again in detail. The main line approach is by through and relief down roads from Windmill Bridge Junction, used by trains from Victoria or London Bridge *via* the direct lines, and a single up line together with up and down local lines normally serving the complex routes between East Croydon, Norwood Junction and Selhurst for suburban purposes. There are, however, interchange connections between main and local lines at Windmill Bridge Junction, so that, when convenient, main line trains can be sent through East Croydon over the local lines, or suburban trains worked through the main line station.

For down main line traffic No. 3 island platform is used, the western face serving the main through line. Stopping trains may, however, be brought to either face, and where interchange is made between London Bridge and Victoria trains the former usually travel *via* the down main relief line to reach the eastern face of No. 3, so that there is no conflict of routes. As the down main relief line is extended through to South Croydon interchanging down trains can, if desired, leave East Croydon simultaneously.

No. 2 island is reserved for up main



TRAIN ENTERING STATION ON DOWN MAIN RELIEF LINE.

Showing gantry carrying down home signals.

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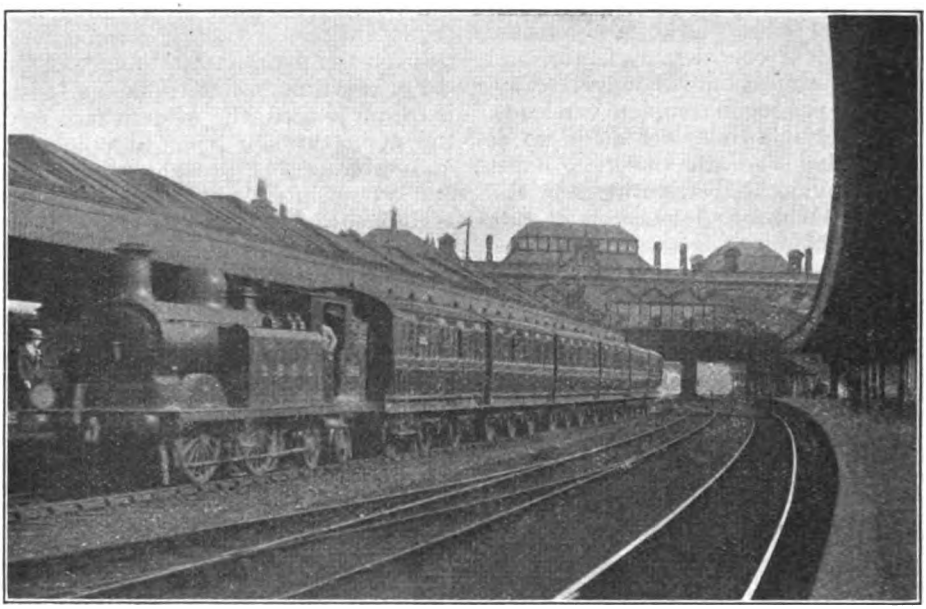
line trains, the eastern face serving the through line on which non-stopping trains pass. The western face constitutes the up main loop, and trains which are divided at East Croydon usually take this road. Non-stopping trains are not allowed to pass this way at speed, as there is a facing junction to an engine spur provided so that, after the front portion of a dividing train has left, an engine can be quickly attached to the second part. On occasions both parts of a train thus dealt with have been got away within three minutes. By using both faces of No. 2 interchange between two up trains not scheduled for division can be conveniently arranged.

The third island, No. 1, constitutes the local station, up trains using one face and down the other. Between Nos. 2 and 1 are two non-platform lines, one leading to the engine spur referred to, and the other being in the nature of a siding for standing vehicles or for shunting purposes. West of No. 1 are the goods offices, goods shed, and the extensive goods and coal sidings, with cattle pens, &c. Loading docks are available on both sides of the station, but those beyond No. 1 are generally used by the goods department, horse-boxes and passenger train traffic being usually dealt with at the double-ended docks beyond No. 3 down main relief.

At the southern end the railway passes under the Addiscombe Road, where the booking offices are situated, and the platforms are all served by long covered inclines instead of stairways. Towards the northern end are milk and luggage subways, also approached by inclines, and with a milk lift to the loading dock beyond No. 3.

The up main island platform, No. 2, is the longest, 650 ft., but Nos. 1 and 3 are not a great deal shorter.



VICTORIA TRAIN AT UP MAIN LOOP PLATFORM.

The station buildings on Addiscombe Road bridge evidence the usual neat and characteristic features found in most Brighton line stations of modern construction. They date from 1897, and include a commodious main line booking office, now used for all purposes, and well lighted by a glazed artistic dome in the roof. The suburban booking office is now adapted as a telegraph office, and there are exit passages, parcels offices, cloak-rooms, &c., to meet the demands of the station. The main building lies back a little from the road, with an

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enclosed courtyard for cabs, &c., sheltered by verandah roof of station platform type, bearing the names of places served by the Brighton company, as usual.

Traffic is controlled by four signal cabins within the jurisdiction of the stationmaster at East Croydon. The North Box is the busiest. It is situated at the north end of No. 2 platform, and controls all station work at that end. It contains 84 levers, and is worked in three 8-hour shifts, two with a signalman and an assistant, and the third (night) by one signalman, in each case with a signal lad for train-

to the north, controls the junctions towards Selhurst or Norwood Junction. This contains 48 levers, and is worked by three signalmen in rotation. Most of the signals are on single posts or ordinary brackets, but a somewhat remarkable gantry carries the down home signals. All tracks in the passenger station are track-circuited.

Adjacent to the loading docks on the down side is a building containing the offices of Mr. E. A. Sturges, District Traffic Superintendent, and of Mr. H. Humphriss, District Goods Superintendent,

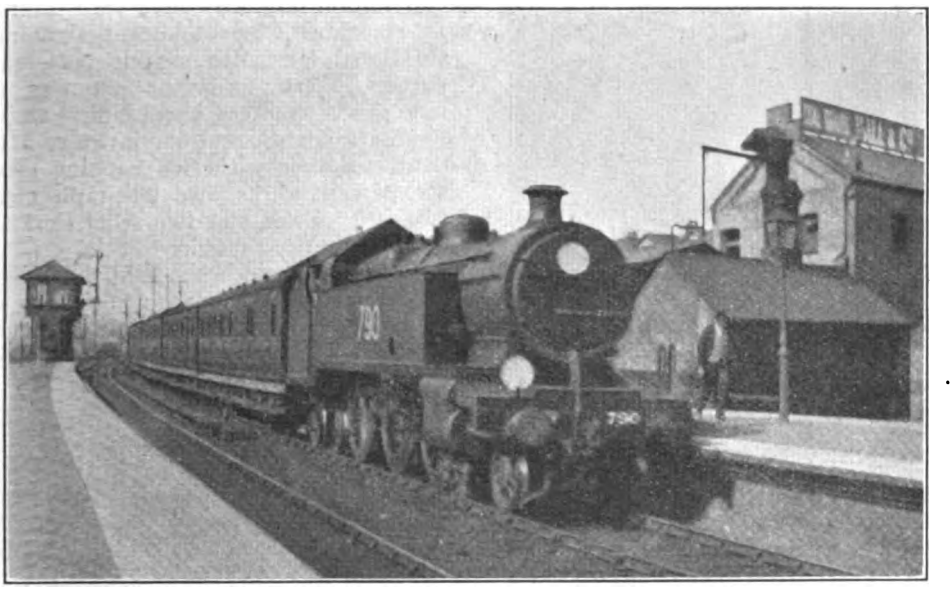

Photo.] [*Eric De Ville.*

S.E. & C.R. TONBRIDGE TRAIN ON DOWN MAIN LINE.
2-6-4 tank engine, No. 790.

booking, &c. South Box, beyond the station, similarly controls the south end, and contains the same number of levers, and duties are arranged as in the North Box. North Box deals also with the goods yard connections, while South Box controls access to and from the Fairfield depôt of the Engineer's Department (Northern District). Below the road bridge is a smaller cabin, known as Central Box, containing 35 levers. This is mainly a shunting box for station work, and is operated only between 7 a.m. and 11 p.m., two signalmen working by shifts in turn. Windmill Bridge Box, about half-a-mile

but there is direct access to this building from the main road.

All platforms in the station have refreshment rooms, and each road has a water crane for the engines. The storage tank, under which is a pumping station, is located adjacent to the goods yard.

East Croydon has its share of special traffic, though the re-introduction of excursion facilities has only partially revived the scenes incidental to the numerous day and half-day trips to Brighton and other places of pre-war days. At holiday periods, however, even at present-day fares the capacity of the station is often

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MR. H. LANGRIDGE,
Stationmaster,
East Croydon, L.B. & S.C.R.

taxed to the utmost. Race meetings also add their quota, and the S.E. & C.R. traffic to and from Tattenham Corner, on Epsom race days, both spring and summer meetings, is very heavy. Although East Croydon no longer collects tickets for London in the ordinary way, it is sometimes found desirable to do this in connection with the return Brighton specials from Gatwick and Lingfield. Continental traffic, once a very important factor, is again a source of considerable pressure, the Newhaven boat trains entraining or detraining many passengers at East Croydon. Indeed, at all times it is a busy station, and although the daily trains do not exceed more than 230–250, there is a heavy transfer of vehicles from one train to another, and the luggage dealt with is by no means a small factor. On the goods side about 50 trains pass through or are dealt with daily.

Under the incline leading to No. 1 platform is a staff canteen, governed by an elected committee of various grades, and this, run by an old servant of the company and his wife, has proved most successful. It supplies also the employees in the Fairfield engineering shops, and is able to serve nearly 100 dinners, with larger numbers of other meals, daily, at virtually cost price.

Although South Eastern and Chatham Railway trains are numerous, East Croydon belongs entirely to, and is staffed by, the Brighton company. Under the stationmaster are four station inspectors, one ticket inspector, 13 ticket collectors, two station foremen, three yard foremen, 11 signalmen, four assistant signalmen, six signal lads, five parcels porters, 21 porters, seven passenger shunters and nine goods shunters, three ladies' waiting room attendants, and one lavatory attendant, together with five booking clerks, six parcels clerks, two telegraph clerks, two lady clerks, and two relief clerks for district duties as required.

Mr. H. Langridge has held the office of stationmaster since 1912, and he has control of all traffic working and traffic staff. The commercial side of the Goods Department is, however, under Mr. W.

MR. W. SILVESTER,
Goods Agent,
East Croydon, L.B. & S.C.R.

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Silvester, Goods Agent. He has a staff of 13 carmen (including those engaged on parcels work), seven van guards, one horse-keeper, two foremen, three checkers, and 15 porters, together with 23 clerks.

Mr. Langridge entered the service at Crawley in 1877 and served as clerk at various stations until 1885, when he became stationmaster at Selham, on the Midhurst branch. Other appointments followed, at Marden Park (now Woldingham), Stoat's Nest (goods), Merton Park, East Dulwich, Havant and Horsham, coming in 1912 to East Croydon.

Mr. Silvester should know Croydon, if anyone does, for he has held the post of Goods Agent for no less than 33 years, following seven at Brighton and four at various stations.

The writer is indebted to officers of the London, Brighton and South Coast Railway for much information utilised in the preparation of this article, and especially for the co-operation of Mr. Langridge and Mr. Silvester.

Photographs of the station reproduced were taken specially for this article by the author, except as noted.

CALEDONIAN RAILWAY LOCOMOTIVE FITTED WITH FEED WATER HEATING APPARATUS.

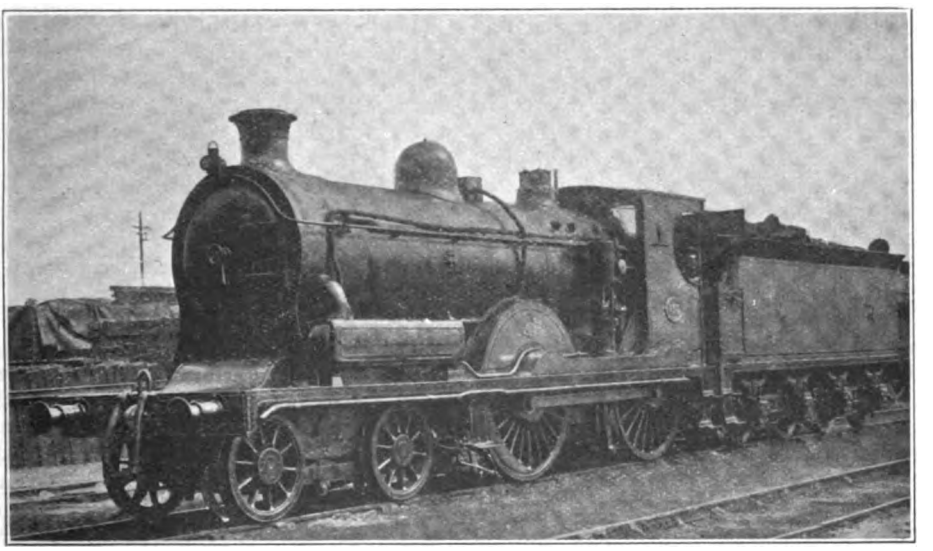

Photo.] [*F. E. Mackay.*

THIS engine, No. 136, has been experimentally fitted by Mr. W. Pickersgill with the Weir feed-water heater and pump placed as shown. Hot feed-water is supplied to the top of the boiler by an arrangement devised by Mr. Pickersgill. The feed pipe enters the "top-feed" casing at one side and thence passes through the clack box to the spraying valve and so into the boiler.

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Locomotive and Train Working in the latter part of the 19th Century.

THE LONDON & SOUTH WESTERN RAILWAY. [No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

I HAVE mentioned that the engines which usually worked over the severe Salisbury-Exeter section had wheels 6 in. less in diameter than those which worked at the London end. For the western section the 2–4–0 engines had 6 ft. coupled wheels, the cylinders being 17 in. by 22 in., but this type was generally of the same design and principal dimensions as the 6 ft. 6 in. engines. The earliest three engines of this class were built at Nine Elms in 1862, and were followed in 1866 and 1868 by five more. Eleven engines were built between 1869 and 1873, and several of these were usually quartered at Exeter for the main line trains to Salisbury, those generally on this section being No. 114 *Frome*, No. 115 *Vulcan*, No. 116 *Stromboli*, No. 117 *Volcano*, No. 118 *Etna*, No. 25 *Reindeer*, and No. 26 *Gazelle*, with one or two others. Most of the trains were worked by Exeter engines and men, except the early morning down trains, which were under the charge of Salisbury engines. The above engines remained at Exeter for many years, even for some time after Mr. Adams had taken charge of the locomotive department. Subsequently several were transferred to the Southampton and Weymouth section, and Mr. Adams rebuilt Nos. 25 and 116 in 1886 for work in this district. Some of the older 6 ft. engines, such as Nos. 63 64, 27, 28 and 30, often worked on the Windsor and Reading lines from London.

There were also six other 6 ft. passenger engines of practically similar design, but of somewhat different outward appearance, Nos. 231 to 236, built by Beyer, Peacock & Co. in 1866. Though good engines, these appear for some reason or other to have done very little main line work throughout their career, and were generally employed on the Reading and Waterloo trains, one of them being stationed at Reading. In Mr. Adams' time some were transferred to Woking, and for about a year, in 1887, No. 231 was lent to the Midland & South Western Junction Railway and stationed at Swindon Town for the 33-mile trip from thence to Andover, which it usually made twice each way daily.

Mention may also be made of a number of single engines, with 6 ft. 6 in. driving wheels and outside cylinders, which this railway also possessed, though in the late 'seventies and early 'eighties they were considered to be in their dotage, and used only on certain local trains in the Portsmouth, Southampton and Hamworthy districts. One of the best-known of this class was No. 135 *Canute*, which, however, departed this life in 1878. No. 131 *Rufus* and No. 150 *Havelock* lasted until 1881, and the last of them to be built, No. 153 *Victoria*, which came out from Nine Elms in 1859, managed to survive until 1885, after which year no more single engines were ever to be found on the South Western, unless we except Mr. Drummond's "inspection" engine No. 733, the "736" class of motor coach engines, and also the "double" single-wheelers with four cylinders of the "720" class. The old *Victoria* had cylinders 16 in. by 21 in. After having been at Northam shed for some time, it finished its career at Portsmouth. There were about ten of these engines in service when Mr. Adams took charge in 1878, but apparently he just looked at them and then sent most of them to the scrap heap the same year.

Something may be said at this point on the subject of "locomotive economics," one of the items of which includes the art of burning a minimum of fuel. It must at once be said that as exponents of this art both Mr. Joseph and Mr. W. G. Beattie were unexcelled, and their engines were supplied with all the means and apparatus

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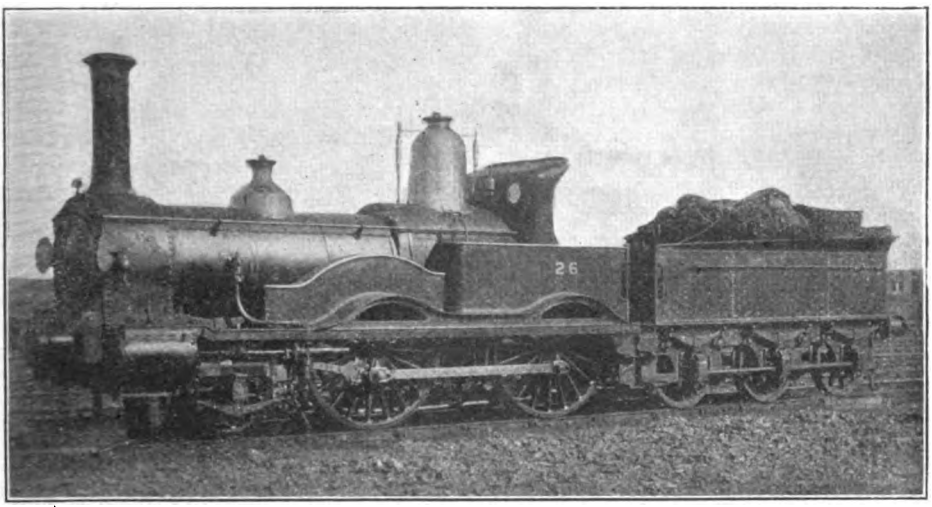
for the noble science of "coal-dodging." In the first place, Mr. Joseph Beattie invented some fearful and wonderful fireboxes with combustion chambers of sorts and sizes various, which saved much coke and coal at the expense of many varieties of leaks. These fireboxes must have cost a good deal to keep in repair, but no authentic figures ever seem to have been produced with regard to this side of the picture. But I think it may be safely asserted that between the fireboxes and the feed-water heating apparatus there were no engines in the kingdom that came anywhere near those of the London



2-4-0 LOCOMOTIVE No. 26 ("GAZELLE").

Designed by Mr. W. G. Beattie and built at Nine Elms, 1872. Cylinders, 17 in. by 22 in. Coupled wheels, 6 ft. diam. (The name was added later.)

& South Western in the matter of keeping within very limited coal rations.

In the earlier and more complicated type of 1855 there was, in addition to the patent firebox proper, a combustion chamber, which occupied a considerable portion of the length of the boiler barrel. This chamber was partly filled with perforated firebricks built up into a regular pattern. The hot gases from the firebox passed into the combustion chamber and through the interstices of the firebricks, thus mixing the air and the gases, whilst promoting more perfect combustion and the giving up of as much of the heat as possible to the water in the boiler.

The combustion chambers were too much of a complication to last many years, and eventually disappeared into the limbo of forgotten locomotive things, but the fireboxes themselves remained. The Beattie coal-burning firebox consisted of a front and a back chamber separated by a transverse inclined partition or water bridge. There were two fireholes, of which the lower one formed the opening into the back chamber next to the footplate, and the upper one was placed so that the fuel could be thrown over the transverse partition into the front chamber beneath the tube plate. The fire in the latter was kept in a red-hot incandescent condition, and most of the fresh coal was fired into the back chamber, so that the smoke and unburnt gases from it passed over the bridge into the front chamber, where combustion was completed by means of the incandescent fuel. The front and the back grates were entirely separate, the only connection between the two chambers being by means of the passage over the partition. This passage was interrupted by means of a transverse diaphragm pocket made in the roof of the firebox, so arranged that the gases passing from the back to the front chamber were deflected downwards on to the incandescent fuel in the latter, before passing into the tubes of the boiler.

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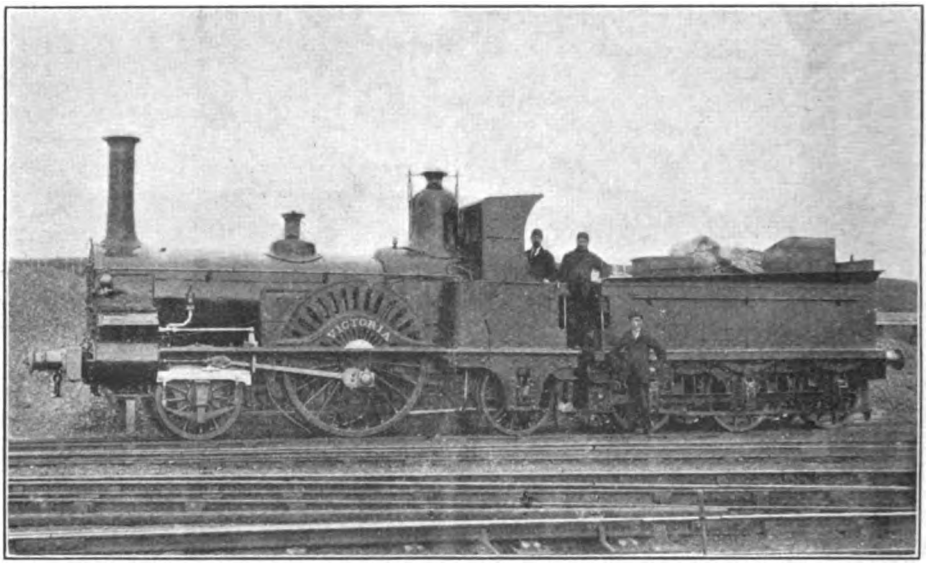
But the "ultima Thule" of locomotive economy was not reached even with the aid of balanced valves with very long laps and of the patent coal-burning fire-boxes. On the long road to perfection no sooner has the wayfarer arrived at the top of one mountain than he perceives another and a higher peak before him. Mr. Joseph Beattie was out collecting useful British thermal units, and to add to this collection he also turned his attention to the heating of the feed-water, so much so that his labours in this direction merit the recognition of all locomotive engineers.

At one period a considerable number of the South Western engines appeared with what seemed to be two chimneys, of which a smaller one was placed immediately in front of the other, and looked like a "pup" of the latter. However, in reality, the smaller one was not a chimney at all, but a condenser. The exhaust steam from the cylinders passed through a tubular heater into the condenser, where it met a jet of cold water pumped from the tender. The resultant hot water was delivered into a long pipe with a branch so arranged that when feed-water was required for the boiler the driver could by means of a cock on the branch divert part of it into a hot water pump which delivered into the heater and thence into the boiler. If the feed had to be shut off, the cock on the branch was closed and the whole of the hot water was delivered to the tender, where it helped to heat the cold water.

There were, however, faults of principle in this system, one of which was that a jet condenser was used, and the oil in the exhaust steam was returned to the boiler. Accumulation of grease or oil in a boiler is very detrimental to the plates, and there is a great danger of the overheating and burning of the latter. So Mr. Beattie set about improving the feed-heating apparatus, dispensed with the "pup chimney" or jet condenser, and eventually evolved an arrangement which was fitted to all the South Western engines constructed down to 1878. An exhaust branch was taken from the blast pipe and issued from the side of the smokebox, where it was joined by a cold water pipe connected to the cold water pump. The pipe from this point back to the footplate was concentric, and enclosed an inner pipe, through which the water to be heated passed. The exhaust steam from the blast pipe was contained in the outer pipe which surrounded the inner one, and its heat was given up to the water, which was fed into the boiler by means of



2-2-2 LOCOMOTIVE No. 153, "VICTORIA."

Built at Nine Elms, 1859. Cylinders, 16 in. by 21 in. Driving wheels, 6 ft. 6 in. diam.

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a donkey pump on the opposite side of the engine. There was also an independent feed for supplying cold water to the boiler in cases of emergency.

I have a number of detailed tests of Beattie's feed-water apparatus before me, which were made between London and Windsor in 1876. Starting from Waterloo with cold feed water in the tender at a temperature of 69 deg., the temperature in the pipe between the pump and the feed-water apparatus rose gradually from 70 deg. at the beginning to 98 deg. at the end of the journey, and the temperature of the feed delivered to the boiler was about 120 deg. just after the start, and rose to 174 deg. at the finish. The temperature in the tender on arrival at Windsor was 86 deg. On the return journey somewhat higher temperatures were recorded owing to the water in the tender having been warmed up on the down journey. The water was delivered from the pump to the apparatus at about 80 deg. to 84 deg., leaving Windsor, and at 104 deg. to 106 deg. on reaching Waterloo, whilst the feed temperature reached a maximum of 184 deg., but averaged about 164 deg. On another occasion engine *Persia*, No. 280, gave still better results and delivered the feed to the boiler at a maximum of 194 deg. and an average of 172 deg.

In the articles on the South Eastern Railway I mentioned that Beattie's 6 ft. 6 in. coupled engine *St. George*, No. 121, ran trials on that line between London and Dover against one of Cudworth's 7 ft. singles. On Sundays *Vesuvius*, No. 119, a sister engine, took the place of *St. George*, and on one occasion *Castor*, No. 96, a 7 ft. coupled was used. When writing on the subject of the South Eastern, I proceeded to give what purported to be the Bricklayer's Arms version of the trials.* On this occasion I naturally chronicle the Nine Elms story, which was of a somewhat different colour, and I must candidly admit that in the matter of fuel consumption the "Beattie" engine seems to have had the best of it. The trials lasted for a whole month, and, with an average load of 14 coaches, Beattie's engine averaged 23 lb. of coal per mile on the Dover mails. I once tried to obtain the detailed figures but I am afraid they have been consigned to oblivion, and the Cudworth figures never succeeded in getting past the South Eastern press censor at Ashford. The Bricklayers Arms version was distinctly picturesque, but very elusive when it came to the gleaning of solid facts.

* RAILWAY MAGAZINE, July, 1917.

(To be continued.)

Locomotive and Train Working in the Latter Part of the Nineteenth Century.

Railways already dealt with in the "Railway Magazine" by Mr. E. L. Ahrons are:—

L. & N.W.: Jan., Feb., March, May, 1915. (All out of print.)

GREAT NORTHERN: June, July, 1915. (Both out of print.)

MANCHESTER, SHEFFIELD & LINCOLNSHIRE: Aug., Sept., Oct., 1915. (Aug. and Oct. out of print.)

GREAT WESTERN: Nov., Dec., 1915. Jan., Feb., March, April, May, June, July, Aug., 1916. (All out of print.)

GLASGOW & S.W.: Sept., Oct., 1916. (Both out of print.)

GREAT EASTERN: July, Aug., Sept., Oct., Nov., Dec., 1918. (Dec. out of print.)

NORTH EASTERN; Nov., Dec., 1916. Jan., Feb., March, April, May, 1917. (All out of print.)

SOUTH EASTERN: June, July, Aug. 1917.

LANCASHIRE AND YORKSHIRE: Sept., Oct., Nov., 1917.

LONDON, CHATHAM & DOVER: Dec., 1917. Jan., Feb., 1918. (Jan. out of print.)

CALEDONIAN: March, April, May, June, 1918.

LONDON BRIGHTON & SOUTH COAST: Jan., Feb., March and April, 1919. (First three out of print.)

MIDLAND: May, June, July, Aug., Sept., Oct., Nov., Dec., 1919. Jan., Feb., March, 1920.

NORTH BRITISH: April, May, June July, Aug., Sept., 1920.

All parts still in print are One Shilling each.

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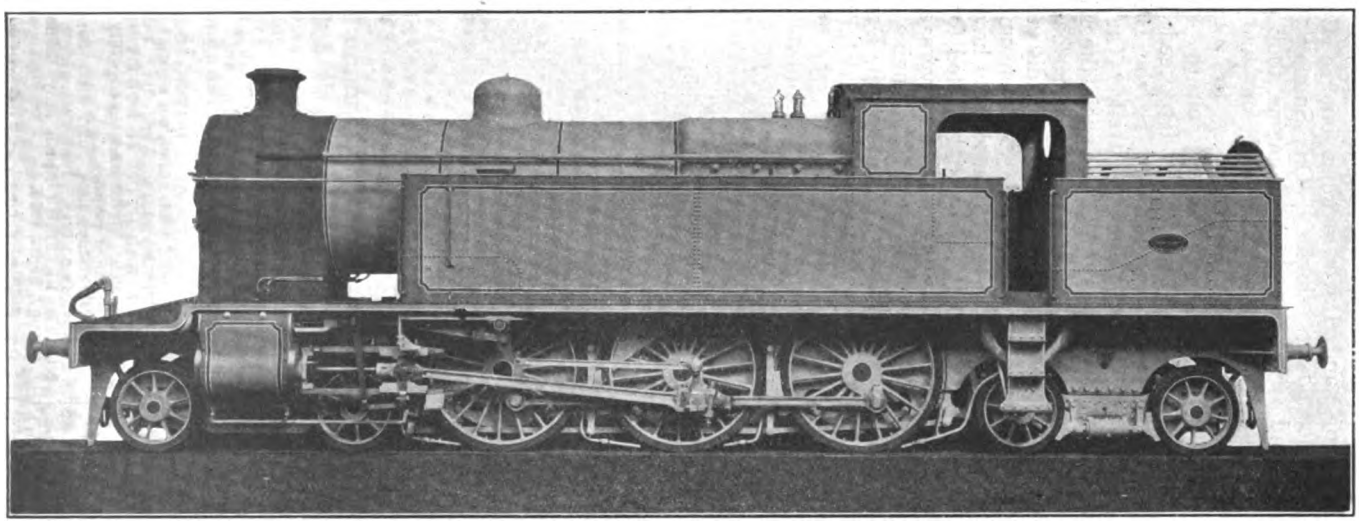
4-6-4 TANK ENGINE, BELFAST AND COUNTY DOWN RAILWAY.



DESIGNED by Mr. J. L. Crosthwait, Locomotive Superintendent, and built by Beyer, Peacock & Co., Limited, these are the first broad-gauge 4-6-4 tank engines used by an Irish railway company. Design is essentially modern, including piston valves actuated by Walschaert valve gear, Belpaire firebox, " Pop " safety valves, &c.

LEADING DIMENSIONS.

Gauge	.. ..	5 ft. 3 in.	
Cylinders	.. ..	19 in. × 26 in.	
Coupled wheels	..	5 ft. 6 in. diam.	
Bogie wheels	..	3 ft. diam.	
Total wheelbase	..	35 ft. 3 in.	
Steam pressure	..	170 lb. per sq. in.	
Heating surface, tubes		1,497·2 sq. ft.	
Ditto,	firebox	124·5 sq. ft.	
Ditto,	total	1621·7 sq. ft.	
Grate area	.. ..	24·7 sq. ft.	
Coal capacity	..	4 tons.	
Water capacity	..	2,000 gallons.	
Weight, loaded	..	81 tons 12 cwt.	

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WHITBY, WEST CLIFF, STATION.

From Saltburn to Scarborough by the Coast Line: North Eastern Railway.

By H. L. HOPWOOD.

(*Photographs by the Author.*)

IT is safe to say that no part of the North Eastern Railway offers a greater variety of attractions than does the line between Saltburn and Scarborough. Throughout its length of 45 miles, scenic surroundings are of the highest order, and, as it runs along the coast, the line commands a series of magnificent sea views. It is boldly engineered and possesses works of considerable magnitude; viaducts, tunnels and cuttings succeeding each other with bewildering frequency; whilst gradients may be described as truly formidable.

It will be convenient to consider this line in two parts, viz, from Saltburn to Whitby, and from Whitby to Scarborough, the former, being the older, claiming first attention. The northern half of this section runs through the outskirts of the Cleveland Hills and serves several ironstone mines and the ironworks at Skinningrove. That part from Brotton to Skinningrove is the oldest portion of the coast line, having been constructed as an extension of the Cleveland Railway and opened between Boosbeck and Skinningrove ironworks in 1865, for mineral traffic only.

At the time of the Cleveland and North Eastern Railways amalgamation (1865), the former company had under construction a further extension in the shape of Kilton Viaduct, which connects Skinningrove with Loftus, and this piece of line the North Eastern Railway brought into use early in 1867. This was followed by the opening of the Saltburn extension—another mineral line, connecting Saltburn with Brotton—on June 1, 1872. Thus, in the year named, there was a continuous line from Saltburn to Loftus, but it was not until April 1, 1875, that stations were opened at Brotton, Carlin How (now called Skinningrove) and Loftus and a passenger service instituted from Saltburn to Loftus.

Meanwhile, a company called the Whitby, Redcar and Middlesbrough Union Railway planned an extension southwards

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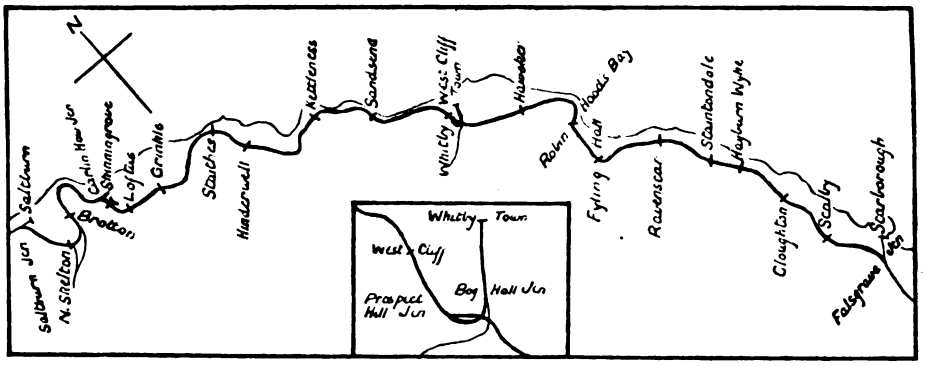
from Loftus to Whitby. Construction of this line started in 1871, but owing to want of money, progress stopped four years later. In these circumstances the North Eastern Railway agreed to lease the line, complete it, and work it for 50 per cent. of gross receipts. Opening between Loftus and Whitby (Bog Hall Junction) took place on December 3, 1883 and, finally, the smaller company was absorbed by the North Eastern Railway in 1889.

Saltburn Junction, 60 chains on the west side of Saltburn station, is the point of divergence of the Whitby line. The junction faces in the wrong direction (*i.e.*, towards Redcar) for through working and it is therefore necessary for Whitby and Scarborough trains to reverse at that place. From Saltburn to Loftus the



SALTBURN AND SCARBOROUGH SECTION, NORTH EASTERN RAILWAY.

distance by road is five miles, but by rail it is nine miles, the line taking a circuitous route round the base of Warsett Hill by means of a horseshoe curve, made in order to work the ironstone mines on both sides of the hill. Half-way along this curve the railway runs on to the cliffs at a point known as Huntcliff, but immediately turns inland again.

The approach to Skinningrove Ironworks is by means of the branch from Carlin How Junction. A little further on is a steeply graded "zig-zag" line from Skinningrove station, with a reversing point midway. This leads to Carlin How mines and Loftus mines. At Loftus we see almost the last of the ironstone works, and southwards some delightful country is traversed, with views of the distant Cleveland Hills on one side and of the sea on the other. Near Grinkle there is a long tunnel through the high ground which leads up to Boulby cliffs, two miles away. These cliffs are 666 ft. above the sea, with one exception the highest point on the English coast. The railway reaches the coast again at Staithes and runs nearly parallel with it thence to Whitby.

A feature of the district is the number of "becks," or streams, which flow through deep and wild-looking gorges on their way to the sea. Seven of these gorges are spanned by viaducts of considerable size. The first, which bridges Skelton Beck, is encountered soon after leaving Saltburn Junction. It dates from 1872 and is a brick structure of 11 elliptical arches, 783 ft. in length and with a maximum height of 150 ft. Between Skinningrove and Loftus is the Kilton Viaduct, but passengers will look for it in vain to-day as it is entirely covered by an embankment. Built in 1865-6, it is located on a curve of 18 chains radius and consists of 13 wrought-iron lattice girder spans supported on freestone piers. The length is 678 ft. and the height above the level of the beck, 150 ft. The circumstance that the whole neighbourhood is honeycombed with mine workings, which extend under the foundations of the viaduct itself, rendered it desirable for some precautions to be adopted for the safety of the structure. Accordingly, the somewhat drastic step was taken of completely burying the viaduct, and to do this no less than 720,000 tons of spoil from the adjacent mines were required. The work of filling in was completed in the summer of 1912 and

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now a huge embankment marks the resting place of Kilton viaduct.

Another notable viaduct is that north of Staithes station, 700 ft. long and 152 ft. high. It consists of 17 spans (6 of 60 ft. and 11 of 30 ft.), supported on piers which are formed of two cylindrical iron columns filled with cement. This bridge had been partly erected in 1875 by the Whitby & Redcar Company, but the piers, owing to their great height, were afterwards braced together by two rows of longitudinal lattice girders, this addition taking place before the line was opened in 1883.

station. The line is heavily graded throughout, as will be seen by reference to the accompanying gradient profiles. From West Cliff to Whitby Town station the track is on a sharp curve and a gradient of 1 in 50 in its descent of the Esk Valley, in order to join the low-level Whitby-Pickering line at Bog Hall Junction.

Half a mile south of West Cliff station is Prospect Hill Junction, the starting-point of the line projected by the Scarborough and Whitby Railway. This company was incorporated in 1871, and con-

ROBIN HOOD'S BAY STATION.

In the 2¼ miles between Sandsend and Whitby there are four similar, but smaller, viaducts—the Sandsend, East Row, Newholm and Upgang—with 8, 8, 11 and 6 iron spans respectively. Sandsend viaduct also has two stone arches at the south end. That at East Row differs from the others in having the superstructure supported by girders of inverted truss type.

There are tunnels at Grinkle, Kettleness and Sandsend, measuring 992, 311 and 1,650 yards respectively. Through the last-mentioned tunnel there is a gradient of 1 in 57, falling towards Sandsend

struction of the line began in the following year, but—as was the case with the Whitby and Redcar Railway—financial difficulties made progress very slow. Thirteen years elapsed before the line was ready, its opening for traffic taking place on July 16, 1885. Worked from the first by the North Eastern Railway for 50 per cent. of gross receipts, it became their property in 1898.

At Whitby the railway skirts the back of the town and comes out on the cliffs in the neighbourhood of Hawsker. Thereafter, on the way to Scarborough, the bold and rugged coast is seen to great

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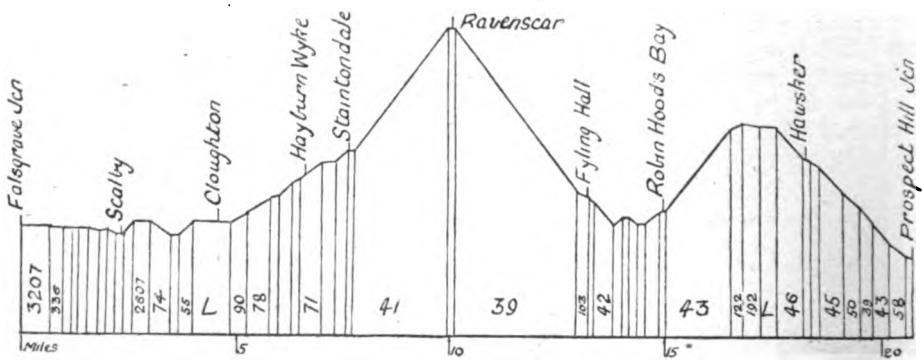
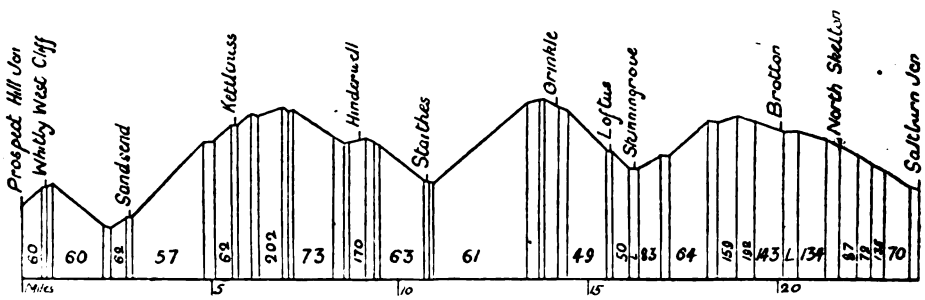
advantage. Between Robin Hood's Bay station and Ravenscar tunnel the line takes a wide sweep round Robin Hood's Bay, and, on looking back before entering the tunnel, a great expanse of ocean is visible, with the distant red-roofed "Bay Town" as a fitting background. The line passes next through the romantic glen of Hayburn Wyke and finally terminates at Scarborough by a junction (Falsgrave) facing towards Malton. Here, again, as at Saltburn, it is necessary for trains to be reversed before entering the station.



GRADIENT PROFILE, SCARBOROUGH TO WHITBY.



GRADIENT PROFILE, WHITBY TO SALTBURN.

The only notable viaduct on this section is that across the Esk Valley at Whitby, a red brick structure of 13 arches, with a total length of 915 ft. and a height above the river bed of 120 ft. The width of each span varies from 55 ft. to 65 ft. Beneath the viaduct are situated the Whitby-Pickering branch and the spur line from Whitby Town to West Cliff, the latter running up to join the Whitby-Scarborough section at Prospect Hill Junction.

Gradients south of Whitby are much steeper than they are north thereof. The run to the first station (Hawsker) involves a 2½-miles climb at 1 in 41, 58, 43, 39, 50, 46 and 140 (in the order shown), followed by another half-mile at 1 in 46 after that station. Further on there is a drop at 1 in 43 for 1½ miles into Robin Hood's Bay station. From that place to Fyling Hall there are two miles undulating at 1 in 67, 53, 51 and 42. Next there comes the hardest piece of all. The start from Fyling Hall is made on a rising grade of 1 in 103, but this soon changes to 1 in 39, and continues so for nearly three miles to Ravenscar. On this section conditions are made worse by the existence of a tunnel near the summit. Ravenscar is the highest point between Saltburn and Scarborough, and although the station is only a quarter of a mile inland, the altitude is no less than 631 ft. From the summit there is a five miles descent to Cloughton, including two miles at 1 in 41. Onward to Scarborough the course is practically level.

Reference was made in the preceding

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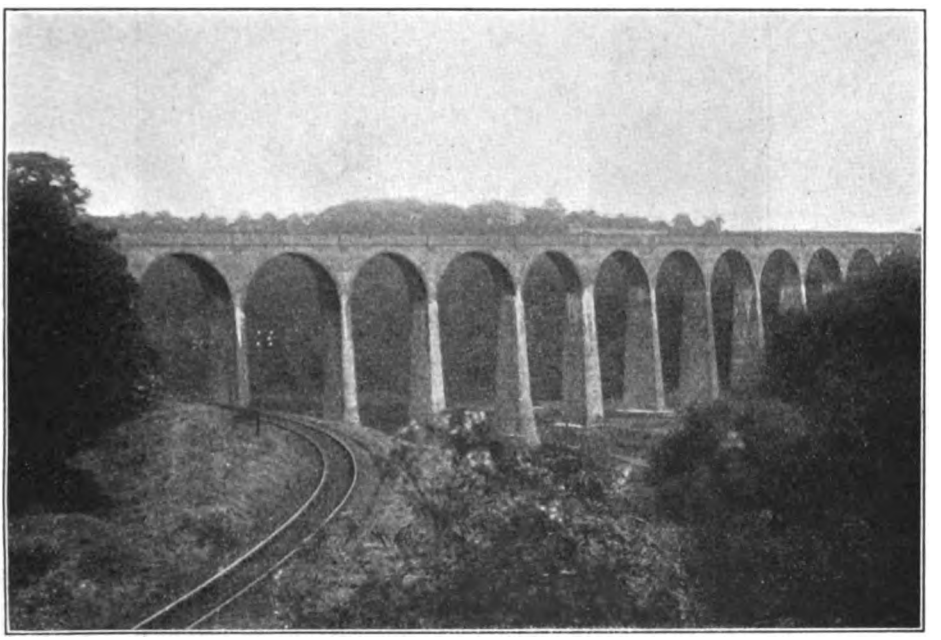
paragraph to Ravenscar tunnel: it is only 279 yards long, but is awkwardly situated near the top of the 1 in 39 incline. At Scarborough is Gallows Close tunnel (260 yards), and immediately following comes Falsgrave Junction, the terminating point of the Saltburn-Scarborough section.

From Carlin How Junction to Falsgrave Junction, a distance of 37 miles 50 chains, and from Prospect Hill Junction to Bog Hall Junction (70 chains), the track is single, but other portions are double line (*i.e.*, between Saltburn station and Carlin How Junction and from Falsgrave Junction to Scarborough). The line is worked by electric tablet, except from Prospect Hill Junction to Ravenscar, between which points the staff and ticket system is in operation. Crossing places exist at every station except Skinningrove, Sandsend, Hawsker, Fyling Hall, Hayburn Wyke and Scalby. Following the outbreak of war, two of these places were closed for passenger traffic, viz., Fyling Hall on November 1, 1915, and Hayburn Wyke on March 1, 1917. The former has since been reopened.

The line is a most difficult one to work. In the first place, all branch trains have to reverse direction outside Saltburn and Scarborough, and those between Whitby Town and Scarborough perform the same evolution at Whitby West Cliff. Then, again, steep gradients and sharp curves, in combination with a long stretch of single line, render anything more than a moderate rate of speed out of the question. With all these adverse conditions operating, it is not surprising to find that through trains occupy about 2½ hours in running from Saltburn to Scarborough, a distance of 45 miles 58 chains.



ESK VALLEY VIADUCT.
Whitby Town—West Cliff line in foreground.

Set trains of four 49 ft. bogie coaches are employed on these services. The following particulars of a set, recently noted, are quoted as a typical example, though the weights of other similar trains may vary slightly :—

	Weight. tons.	cwts.
Brake third	21	3
Third	22	5
Compo.	22	1
Brake third	21	3
	86	12

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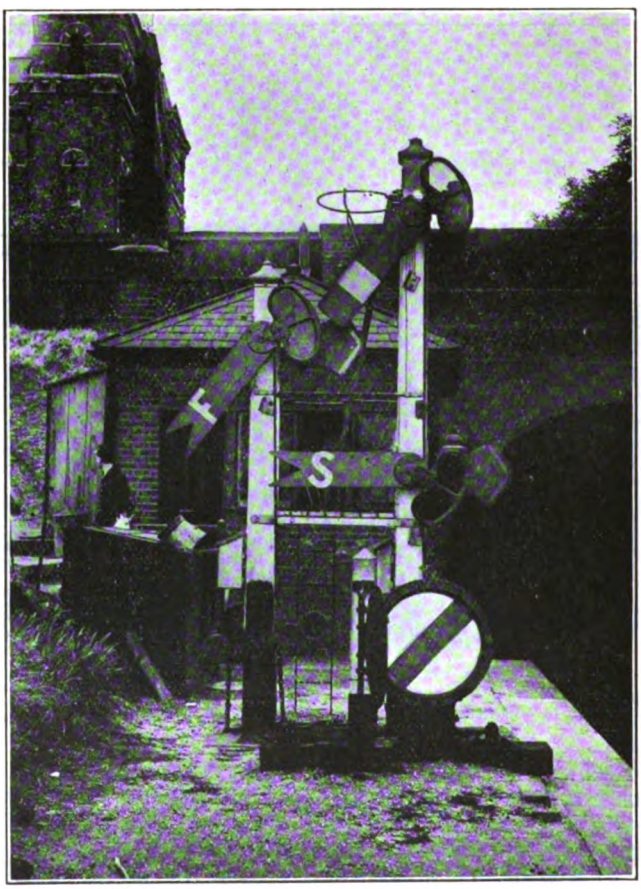
Class "O" tank engines are principally used. They have the 0–4–4 wheel arrangement, with coupled wheels of 5 ft. diam. and cylinders 18 in. by 24 in. One of the Class "D" three-cylinder locomotives usually makes a trip from Saltburn to Scarborough and back. These are very large and modern 4–4–4 tank engines, having 5 ft. 9 in. coupled wheels and three high-pressure cylinders, 16½ in. by 26 in.

Before concluding, the writer would like to express his indebtedness to those North Eastern Railway officials who most courteously afforded every facility for obtaining information on the subject of this article.

AN INTERESTING SIGNAL COMBINATION.



Placed at the London end of the unused platform at Queen's Road, between Clapton and Hackney Downs, Great Eastern Railway, this combination of signals includes the up starting signals, alternative distants to Hackney Downs North Junction (to up Fast or up Suburban lines), and a Sykes' electric banner signal to Hackney Downs North home signal, provided with a shield co-acting with the starting signal so that it is screened when the starting signal is at danger.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN.
A.M.Inst. T.

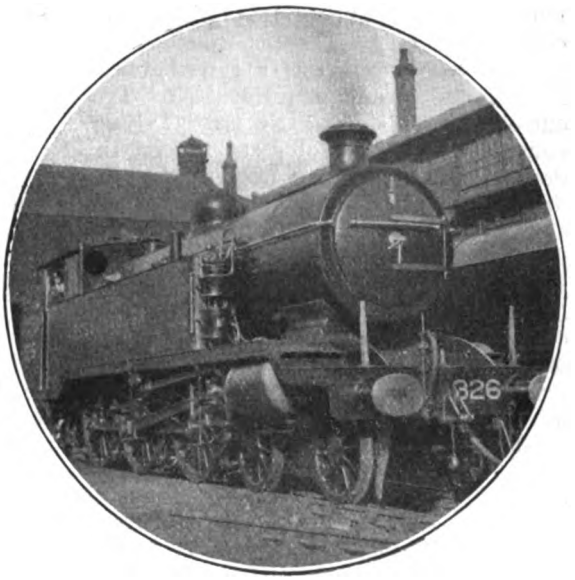

Photo.] [*A. B. MacLeod*

LONDON, BRIGHTON & SOUTH COAST RAILWAY.

4-6-2 express superheater tank engine, No. 326, "Bessborough."

A CONSIDERABLE amount of space in both technical and non-technical journals has been occupied recently with the description of the experiment made by the London & North Western Railway in the equipment of a locomotive for firing with oil. The references in many of the papers—more particularly those of the non-technical variety—would lead the untutored reader to suppose that oil-fired locomotives were an entirely new departure. One newspaper gave the Great Eastern Railway the credit of having *tried* an engine with oil fuel, but added a priceless explanation of the abandonment of the experiment to the effect that the heat generated was so enormous that the authorities responsible had the equipment removed, lest the station buildings should catch fire!

The actual facts are that the Great Eastern Railway had at one period no fewer than 58 locomotives fitted to burn oil fuel on the Holden system. The genesis of the experiment was, I believe, a slight difference of opinion with the sanitary authorities as to the disposal of the waste products of the oil-gas plant at Stratford, which led to the Holden locomotive burner being devised for their utilisation. So successful was the principle found to be in operation that considerable quantities of suitable oil were purchased to supplement the limited supply of fuel just mentioned, and an increasing number of engines—mainly of the express passenger type—were equipped, until the total number reached the figure quoted. Growing demands for oil, however, forced the price of that commodity, even in these early days, up to such a level that oil-firing was no longer an economical proposition, and the engines concerned were, therefore, converted to burn coal—a simple operation, merely necessitating the removal of the burners from the firebox and the oil supply tank from the tender. The engines so fitted were a number of the "T. 19" class 2–4–0's, including the well-known No. 760, *Petrolea*, the "1000" class 2–2–2's, the "10" class 4–2–2's and the earlier engines of the 4–4–0 "Claud Hamilton" class, as far down as the "1880" series. So oil-burning on this comparatively extensive scale continued on the Great Eastern Railway well into the present century.

From tests made Mr. Holden estimated the relative consumption, with engines of similar general design working on the same

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express services, at 17·6 lb. of oil to 34 lb. of coal per mile. I notice that on the London & North Western runs between London and Birmingham the 4–4–0 "Precursor" class engine No. 2585, *Watt*, consumed 32½ lb. of oil per mile on the down journey with the 11.30 a.m. train, and 24½ lb. per mile in returning on the 4.50 p.m., but these figures apparently cover the oil used in lighting up and in standing, which accounts for the much heavier figure on the down journey. By calculation, however, the actual amount of oil used while running works out at 24·3 lb. per mile on the down journey and 23·1 lb. on the up, which is in rough proportion to the respective loads of 294 and 264 tons. Even though substantial amounts of time were gained, the running recorded on this occasion was by no means exceptional. Willesden Junction was passed in 9¼ min., Watford in 23½ min., Tring in 40 min., Bletchley in 55 min., Roade in 69½ min., Blisworth in 72¾ min., Weedon in 79¾ min., and Rugby in 94 min., Coventry (94 miles) being reached in 109 min., or in 8 min. less than schedule time. The 19 miles thence to Birmingham were run in 24¾ min., or 2¼ min. inside schedule time. Without the Coventry stop the total net time to Birmingham would have been a shade over 130 min., whereas the standard pre-war time was 120 min.

It will be noticed that the times were inferior (except as regards the start to Willesden, where the lighter load would tell considerably) to those I recorded in the last issue behind the 4–6–0 "Prince" No. 1670, on the 11.5 a.m. down, with a tare load of 381 tons. The latter, of course, had the advantage of superheating equipment, and in this connection it seems, perhaps, a little strange that a non-superheater rather than a superheater engine should have been selected for the purposes of the experiment.

The general principle of the "Scarab" system is similar to that of the Holden burner, being that of atomising the oil by means of a steam or air jet to a very fine spray, the pressure of the jet varying from 5 to 15 lb. per sq. in., according to the rate of combustion desired. In the London & North Western experiment steam is employed, whereas the Holden

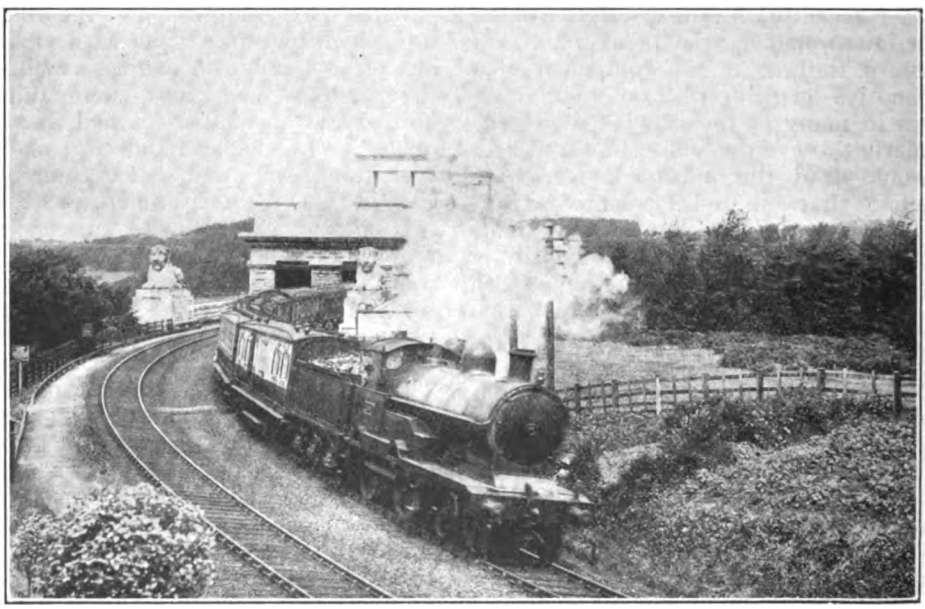

Photo.] LONDON & NORTH WESTERN RAILWAY. [*Leslie J. Thompson.*

10 a.m. train ex Holyhead leaving Britannia tubular bridge. 4-4-0 superheater locomotive No. 1481 "Typhoon."

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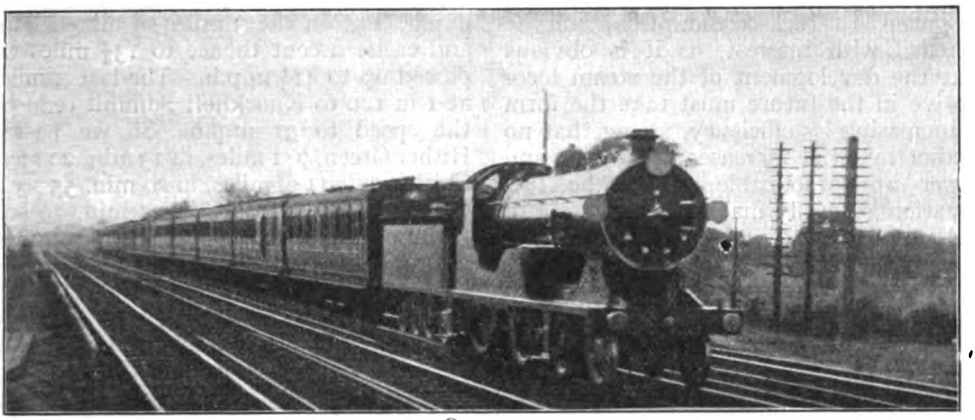

LONDON & SOUTH WESTERN RAILWAY.

Bournemouth-Waterloo express approaching Raynes Park. 4-4-0 locomotive No. 468.

burner was designed for use with compressed air, heated by means of the Westinghouse pump exhaust. Another fuel experiment* is at present being conducted on the Great Central Railway, the large 2–8–0 mineral engine No. 420 having been adapted to burn a " colloidal " fuel mixture consisting of 60 per cent. pulverised fuel and 40 per cent. oil, in competition with the wholly pulverised fuel-burning engine No. 422, and No. 419 of the same type, fitted with an ordinary grate. No. 420 differs from the London & North Western engine *Watt* in that the former has the burners arranged at the back of the firebox, whereas in the latter they are at the front. Based on performance the colloidal fuel engine gave considerably the best results on the Great Central Railway, running a train of 80 empty wagons and brake (499 tons without and 540 tons with tender) up the arduous incline from Dewsnap sidings, Guide Bridge, to Dunford No. 3 Box, at the east end of Woodhead tunnel, in 74 min. For a large proportion of the distance the adverse grade varies from 1 in 100 to 1 in 122. With a similar train (497 tons without and 533 tons with tender), No. 419 took 83 min., whereas the time of the pulverised fuel engine No. 422 for the 16¾ miles was 89 min. with 500 and 545 tons. The colloidal fuel engine reached a superheat temperature of 650 deg. at Godley, and thereafter maintained this level practically unbroken. No. 419 touched 640 deg. at Godley, but from there to Woodhead ran at from 620 to 635 deg., while No. 422 worked only at 535 to 600 deg. until nearly to Crowden, after which the temperature rose to 650 deg. Further than this, No. 422 kept the working pressure up to 175 to 180 lb. per sq. in. throughout the climb, whereas No. 419 dropped at one point to 165 lb. and No. 422 to 154 lb. No figures as to consumption of fuel are given, so that it is not possible to compare the running costs with the times observed, but it is quite evident that the colloidal fuel engine put up some excellent work with a class of fuel that, proportionately to the quantity consumed, is probably of materially less cost than coal.

Other experiments with oil fuel have been taking place recently in France, and one, in particular, on the Paris-Orleans Railway, with a superheated 4–6–2 compound express locomotive. The most interesting feature of the latter trial has been that it confirms exactly Mr. Holden's figure as to the relative consumption of oil fuel and coal in the performance of the same duties, the proportions in the French case being 1 to 1·94. The French engine has been burning *mazout*, a crude form of petroleum, which is a similar type of oil to that which the Great Eastern Railway purchased in past years in order to supplement the oil-gas residue with which their experiments were first made. Further developments in this direction, as in that

* See page 317 of this issue—Ed. *R. M.*

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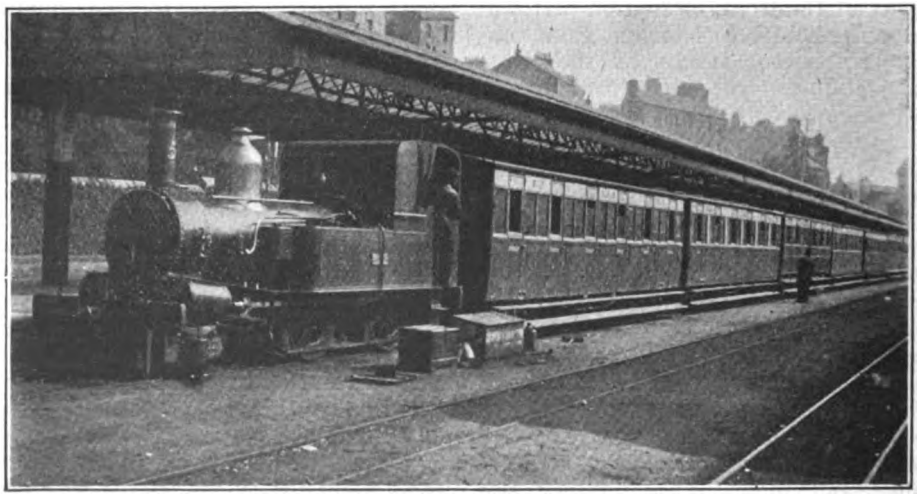
of pulverised fuel consumption, will be watched with interest, as it is obvious that the development of the steam locomotive in the future must take the form of increasing its efficiency, seeing that no further material increases in its size and power are practicable, while the fuel situation generally makes the question of fuel supply one of vital importance at the present time.

Through the kindness of Sir William Forbes and Mr. P. C. Tempest, the respective General Managers of the London, Brighton & South Coast and South Eastern & Chatham Railways, I have recently been afforded facilities for renewing my acquaintance with those lines, and propose now to detail the results of my observations on the locomotive work performed. I will take the latter line first.

A trip on the 4 p.m. express from Charing Cross to Folkestone was productive of some good running by the large-boilered superheater 4–4–0 No. 765. Eight eight-wheelers and one six-wheeler made up the load, weighing 245 tons empty and about 265 tons with a full load of passengers and luggage. We threaded the tortuous 1·8 miles to London Bridge in 4 min. 40 sec., but immediately afterwards were all but stopped for adverse signals, and so took 10 min. 10 sec. for the 4·9 miles to New Cross. The 4¾-mile bank to Elmstead Woods (3⅜ at 1 in 120–140) pulled our speed down from 45 to 28½ m.p.h., but on the 3 miles of mixed level and easier ascent thence to 13¼ miles we picked up to 41½ m.p.h. The last 3 miles at 1 in 120 to Knockholt Summit reduced the speed to 31 m.p.h. So we passed Hither Green, 7·1 miles, in 13 min. 20 sec.; Chislehurst, 11·2 miles, in 20 min. 55 sec.; Orpington, 13·8 miles, in 25 min. 10 sec. (3¼ min. late), and Knockholt, 16·5 miles, in 29 min. 40 sec. Descending to Dunton Green we touched 65 m.p.h., and after a fall to 49 on the 1⅛ miles at 1 in 160 up to Sevenoaks Tunnel, we sustained 71½ m.p.h. on the subsequent descent to Tonbridge, the 5·5 miles from Knockholt to Sevenoaks taking 6 min. 35 sec., and the 7·5 miles thence to Tonbridge, passed in 43 min. 50 sec. from the start, 7 min. 35 sec. We were now a bare minute behind time, and carefully made the prescribed reduction of speed. On the easy grades to Paddock Wood our speed recovered to 61 m.p.h., and was maintained entirely between 61½ and 55½ m.p.h. over the undulating stretch thence to Pluckley, but the 3⅛ subsequent miles up, mostly at 1 in 287–200, brought it down to 49½ m.p.h. So the 5·3 miles from Tonbridge to Paddock Wood took 6½ min., the 7·1 miles thence to Staplehurst 7½ min., the 8·6 miles on to Pluckley 9 min. 5 sec., and the 5·6 miles from Pluckley to Ashford 6 min. 10 sec.; total, 73 min. 5 sec. for the 56·1 miles from London, or rather under 71½ min. net. Passing Ashford at 60 m.p.h., we



ISLE OF MAN RAILWAY.
Train in Douglas Station.

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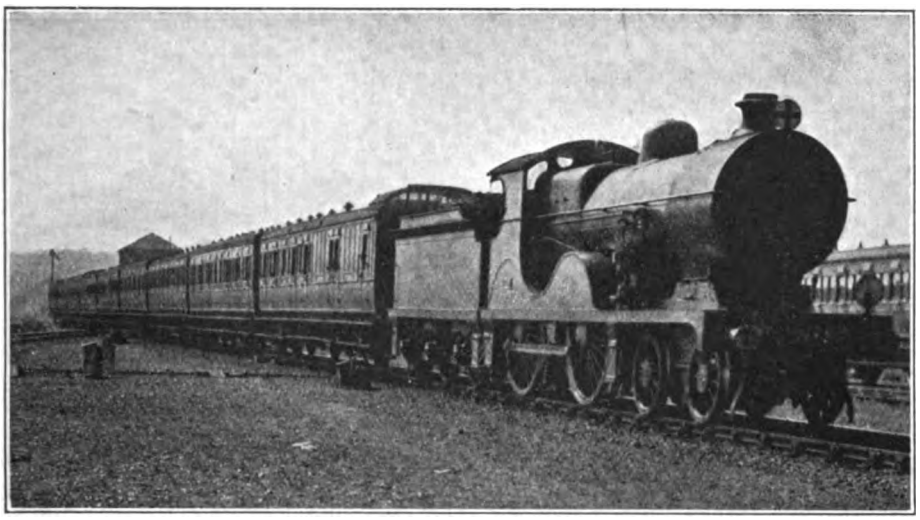

Photo.] SOUTH EASTERN & CHATHAM RAILWAY. [*F. E. Mackay.*

Up Folkestone express, 4-4-0 superheater engine No. 769.

took 10 min. 50 sec. for the 9·3 miles (7¾ ascending at an average of 1 in 288) to Sandling Junction, and then, touching 66 m.p.h. before Shorncliffe, we came to a stand at Folkestone Central, 70 miles, in exactly 89 min. from Charing Cross, 1 min. early. Net time was a little under 87½ min. The 48·8 miles from Dunton Green to Shorncliffe were run in 53 min. 10 sec., inclusive of Tonbridge slack, at an average rate of 55·1 m.p.h.

For my Hastings journey I selected the non-stopping 3·40 p.m. from Charing Cross, which was lightly loaded to a total of six large eight-wheelers only, weighing 178 tons empty and 190 tons with passengers and luggage. No. 772 of the same type was the engine. We were through London Bridge in 4 min. 25 sec., New Cross in 8 min. 20 sec. (at 52½ m.p.h.), Hither Green in 11¼ min., and Chislehurst in 17 min. 55 sec., having fallen to 32 m.p.h. on Grove Park bank; then came a bad p.w.r. check at Chislehurst Junction, after which we accelerated to no less than 49 m.p.h. at Orpington, and only fell to 40 at Knockholt—an excellent piece of work, showing how comparatively easy are the standard South Eastern & Chatham uphill timings on the down journey. Orpington was passed in 22 min. 5 sec., ½ min. early, and Knockholt in 25¾ min. We went without steam for a good part of the descent to Dunton Green, and so only touched 62½ m.p.h., falling subsequently to 53 at Sevenoaks Tunnel, but on Hildenborough bank we broke all my South Eastern & Chatham records by attaining and maintaining a speed of 75 m.p.h., before slacking with exceptional care for Tonbridge. From Knockholt to Sevenoaks took 7 min. 20 sec., and from there to Tonbridge 7½ min.; total, 39 min. 35 sec., or 38½ min. net, from London. The 4-mile bank from Tonbridge to Tunbridge Wells begins with three-eighths of a mile at 1 in 53, and continues with 3½ at 1 in 95–100; the 4·9 miles between the two stations occupied 9 min. 35 sec., with a sustained rate of 34½ m.p.h. on the 1 in 95. Our time over the succeeding 4·9 miles of sharp undulations, mainly adverse, to Wadhurst was 7 min. 5 sec., and from there we covered the 8·1 miles to Etchingham in 7 min. 50 sec., with a top speed of 72½ m.p.h. We were now 3½ min. ahead of time, but a second bad p.w.r. check robbed us of some of this advantage. On the easy grades beyond Etchingham we accelerated to 58½ m.p.h., then fell to 42½ on the 1⅝ miles at 1 in 100 up from 50 miles, touched 60 on the short subsequent descent, and fell to 46 on the 2 miles up at 1 in

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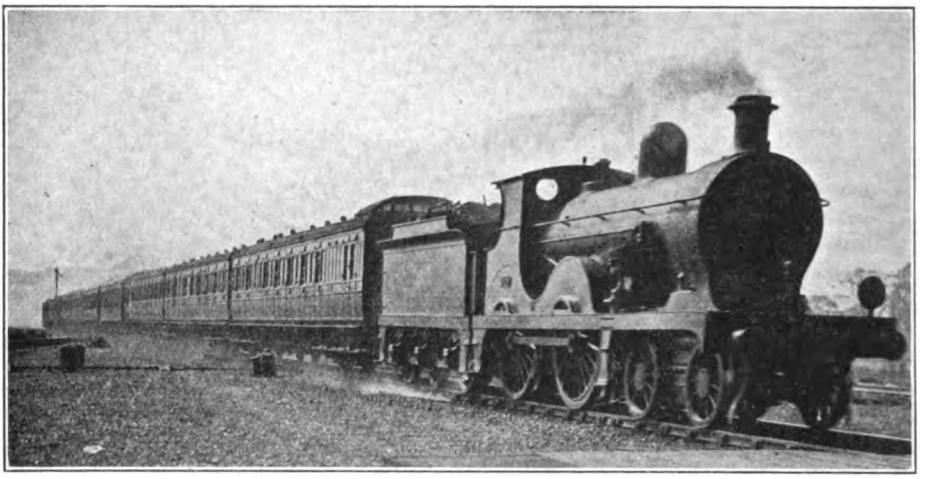

Photo.] SOUTH EASTERN & CHATHAM RAILWAY. [*F. E. Mackay.*

Up Kent Coast Pullman Car express. 4-4-0 engine No. 502.

132–100 past Battle. So the 8·1 miles from Etchingham to Battle took 9¾ min., and we passed Crowhurst, 57·6 miles, in 76 min. 20 sec., 3¾ min. early, at 61½ m.p.h. Unfortunately, a dead stand for signals followed, or, despite both delays, we should have completed the 61·7 miles to St. Leonards in 81½ min. easily, while our net time could not have been more than 79 min. at most, against a schedule of 85 min. This was a really fine run, and, not unnaturally, I was pleased to see the same engine reappear on the 7.10 p.m. up express.

On the latter run our load was practically the same—182 tons empty and about 195 tons full. Leaving Crowhurst a minute late, we had a start of more than half-a-mile up 1 in 100, but passed Battle, 2·1 miles, in 4 min. 55 sec., touched 64½ m.p.h. on the short Battle bank and 69 at Robertsbridge, with an intervening minimum of 52½, and then fell to a steady 41½ m.p.h. on the 6½ miles at 1 in 132–100 up to Wadhurst. So we were through Etchingham, 10·2 miles, in 13¼ min., and Wadhurst, 18·3 miles, in 25 min. 25 sec., reaching Tunbridge Wells, 23·2 miles, in 5 sec. under the schedule allowance of 32 min. Restarting, we ran the 4·9 miles down to Tonbridge very cautiously in 7 min. 55 sec., reducing speed most carefully over the junctions. On the 4 miles at 1 in 122 up to Sevenoaks Tunnel our sustained speed was 35½ m.p.h., and on the 2 miles at 1 in 144 through the tunnel itself we fell further to 34; but we touched 58½ m.p.h. at Dunton Green as a preliminary to a minimum of 39½ at Knockholt, after half-a-mile up at 1 in 204 and two at 143. So we took 13½ min. from Tonbridge to Sevenoaks and 6 min. 50 sec. thence to Knockholt, passing the latter point on time, in ½-min. under the 35½ min. allowance from Tunbridge Wells. Even with the most moderate downhill speeds, almost entirely under 60 m.p.h., we could not avoid gaining time to New Cross, as 13 min. 55 sec. for the 11·6 miles was 1½ min. inside schedule, but by dawdling on into London Bridge we managed to take in all exactly 48 min. for the 32·6 miles from Tunbridge Wells, or 1 min. less than the time allowed. The best train on this service—the 8.30 a.m. from Tunbridge Wells—must, however, have a fairly stiff task to pass London Bridge in 43 min. and reach Cannon Street in 45 min.

The return trip from Folkestone, on the 7.25 p.m. train, was an interesting one, as a Wainwright 4-4-0—No. 742—had to tackle a seven-coach train weighing, with passengers, 200 tons, on times equal, after Ashford, to those of the 90 min. up expresses. It was evident from the start that we were in for some good running, as we accelerated up the 5½ unbroken

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miles at 1 in 263–266 from the Folkestone start to 41½ m.p.h., passing Sandling Junction, 4·6 miles, in 8 min. 35 sec., but between there and Ashford we were badly delayed by signals. Restarting from Ashford in a storm of wind and rain from the south-west, we passed Pluckley, 5·6 miles, in 9 min., and from there to Paddock Wood the speed ranged entirely between 61 and 54 m.p.h., the 8·6 miles on to Staplehurst taking 9 min. 5 sec., and the 7·1 miles thence to Paddock Wood 7 min. 25 sec. After falling to 48 m.p.h. on the 2 miles at 1 in 285–260 beyond Paddock Wood, we got through Tonbridge, where speed was carefully reduced, in 31 min. 40 sec. from Ashford, the distance being 26·6 miles. Then came some really good climbing, the lowest rate on the 1 in 122 being 31½ m.p.h., with an increase in the tunnel—an unusual occurrence—to 35 m.p.h. Further, touching 60 m.p.h. at Dunton Green, we were up to Knockholt at a minimum speed of 41 m.p.h., these figures being better, with a heavier load, than those of the large-boilered engine. So we ran from Tonbridge to Sevenoaks in 13 min. 20 sec., and from there to Knockholt in 6¾ min. Downhill we ran faster than usual, covering the 5·3 miles from Knockholt to Chislehurst—inclusive of a slack to 50 m.p.h. at Orpington—in 5¾ min.; the 4·1 miles from Chislehurst to Hither Green in 3 min. 55 sec., with a maximum of 64½ m.p.h.; the 2·2 miles thence to New Cross cautiously in 2¾ min, and the last 3·1 miles into London Bridge, delayed by a signal check, in 4 min. 55 sec.; total, 69 min. 5 sec. for the 54·3 miles from Ashford, or 68½ min. net, against an allowance of 70 min.

To my disappointment the only failure I recorded was on the part of one of Mr. Maunsell's newly rebuilt and superheated 4–4–0's of the "179" type, on the 3.15 p.m. 92-min. express from Victoria to Margate. We had a very crowded train of 9 "eights" and 2 "sixes," of which the gross weight was fully 290 tons, and lost 4 min. out to St. Mary Cray Junction, 2 more between Faversham and Margate, with a further fractional loss of ½ min. between St. Mary Cray and Faversham. The only delay was a very slight check at Bickley Junction, costing barely ½ min., so that the net time for the journey was fully 98 min. Falling to 25½ m.p.h. at Sydenham Hill, we took 18 min. to Beckenham, 8·7 miles; 30 min. 35 sec. to Swanley, 17·6 miles; 41 min. 35 sec. to

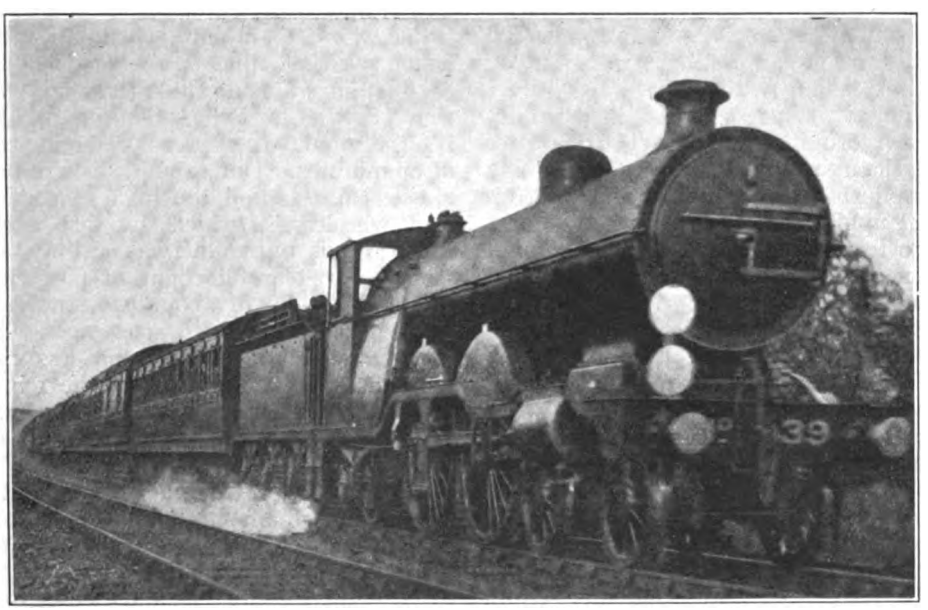

Photo.] LONDON, BRIGHTON & SOUTH COAST RAILWAY. [*F. E. Mackay.*

London Bridge–Eastbourne express near Coulsdon. 4–4–2 engine No. 39, "La France."

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Sole Street, 26·8 miles (there was no higher speed than 66 m.p.h. at Farningham Road); and 51 min. 25 sec. to Chatham. 34·3 miles, with the usual cautious running down Sole Street bank and round the Rochester curves. The 10·4 miles from Chatham to Sittingbourne took 13 min. 10 sec.; the 7·3 miles thence to Faversham, where speed was reduced with unusual caution, 7¾ min.; the 10·7 miles on to Herne Bay, 12¾ min.; and the last 11·2 miles into Margate, 13 min. 20 sec. Maximum speeds were 66 m.p.h. at Sittingbourne, 64½ before and 59 after Faversham, and 65 before Birchington, with an intervening minimum of 41½ before Herne Bay.

But on the return journey, with the 5.20 p.m. 100-min. express, a Wainwright 4–4–0 put up some excellent running with a heavier train. No. 176 was the engine, and 10 eight-wheelers—almost exclusively of the heaviest stock—the load, the gross weight of another very crowded train being 315 tons. The start from Margate includes two adverse ½ miles—at 1 in 132 and 101½ respectively—but we passed Birchington, 3·2 miles, in 6 min. 40 sec., touched 61 m.p.h. on the short subsequent descent, went up the 2 miles at 1 in 100 before Herne Bay at a minimum of 37½ m.p.h. and reached 67 m.p.h. down the similar succeeding bank, passing Herne Bay, 11·2 miles, in 15 min. 55 sec., and Faversham (with reduced speed over the junction), 21·9 miles, in 26 min. 40 sec. Taking the short rise after Faversham in our stride, we were doing 66 m.p.h. beyond Teynham, and went up the 4½ uphill miles culminating in 1½ at 1 in 110 to the 42½ milepost at a minimum of exactly 40 m.p.h. So we passed Sittingbourne, 29·2 miles, in 34½ min.; Gillingham, 38 miles, in 44½ min.; Chatham, 39·6 miles, in 46 min. 20 sec.; and Rochester Bridge, 41 miles, in 48 min. 35 sec., speed over the curves between Gillingham and the last-mentioned point having been carefully restricted. We had thus gained ½ min. on schedule. The 5 miles of Sole Street bank, of which 4⅛ are at 1 in 100, brought our speed down to 24·3 m.p.h., although we recovered near the top to 25·2; the 6·1 miles from Rochester Bridge to Sole Street took 12 min. 55 sec. Most unfortunately our descent to Farningham Road was spoiled by a very bad p.w.r. check, and speed did not get above 61 m.p.h., while falling to 38½ at Swanley; so the 9·2 miles from Sole Street to Swanley took 12 min., and the 5 miles thence to Bickley Junction 6 min. 35 sec. To add to this, a string of bad signal checks caused us to take 7¾ min. over the 3·9 miles, mostly downhill, from Bickley Junction to Beckenham, and 7 min. 35 sec. for the 4·7 miles thence to Herne Hill, but we finished up smartly over the final 4 miles into Victoria in 6 min. 25 sec.—total 101 min. 50 sec. for the 73·9 miles from Margate. But the net time did not exceed 96 min., and over such a road this was a fine performance with this type of engine hauling 315 tons. Indeed, it seems to me that over the really terrible grades of the Kent Coast route, nothing short of a powerful 2–6–0 or 4–6–0 express engine could be relied upon consistently to maintain such a time as 90 min. between Victoria and Margate with any load exceeding seven or eight large bogie cars.

The London, Brighton and South Coast running gave somewhat mixed results, and a curious feature of return trips to Brighton, Eastbourne and Portsmouth was that in not a single instance were we hauled by a tank locomotive. Down to Brighton I travelled by the 11.40 a.m. train, whose 65-minute schedule was the fastest at that time operating over this route. Since I made these runs, however, the "Southern Belle" expresses have been restored to their pre-war running time of 60 minutes. Our engine was a re-built 4-4-0—No. 61—and the load 11 corridor eight-wheelers, of which the tare weight was 236 tons, but as this was entirely light stock and a careful count of passengers revealed a total of about 720, the gross weight of train with passengers and luggage could not have been less than 285 tons. We started well up the 1 in 64 to Grosvenor Bridge, passing Battersea Pier Junction, 0·9-mile, in 3 min. 35 sec., and Clapham Junction, 2·7 miles, in 6 min. 35 sec., but up the 3 miles at 1 in 166–94 to Balham speed fell to 35½ m.p.h., so that the 4·9 miles out to Balham Junction took 10 min. Touching 49 m.p.h. at Streatham Common, and falling to 41 on the 1½ miles at 1 in 264–100 to Selhurst, we passed Croydon, 10·5 miles, in 18 min. Then follow 5 miles up at 1 in 264 to

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Coulsdon, which took 6 min. 20 sec., and on which the lowest speed was 42 m.p.h., and finally ½-mile up at 1 in 100 and 1⅛ at 1 in 165—the Brighton start out of London is a hard one—on which our minimum was 36 m.p.h. So Quarry Box, 18·9 miles, was passed in 30 min. 5 sec., 2 min. behind time. On the descent to Horley we touched 65 m.p.h., covering the 3 miles from Quarry to Earlswood in 3 min 20 sec., and the 4·1 miles thence to Horley in 4 min. 5 sec.; then we compassed the 6½-mile ascent (the last 4⅛ at 1 in 264) to Balcombe Tunnel at a minimum of 47½ m.p.h., running the 3·6 miles from Horley to Three Bridges in 3 min. 50 sec., and the 2·3 miles on to Balcombe Tunnel Box in 2 min. 55 sec. Some fast running was made past Haywards Heath, with a sustained maximum of 72½ m.p.h.; the 6·2 miles from Balcombe Tunnel Box to Haywards Heath occupied 6 min. 5 sec., and the 3·7 miles on to Burgess Hill 3 min. 5 sec. An easy finish over Clayton summit, with a minimum of 48 m.p.h., and a maximum of 60 on the subsequent descent, took us through Preston Park, 49·6 miles, in 62 min. 10 sec., and after a slight signal check outside Brighton, we pulled up in 65 min. 5 sec. from Victoria, the net time being about 64¼ min. Between Balcombe and Burgess Hill we covered 7·6 miles in 6 min. 40 sec., at an average of 68·4 m.p.h. This was, indeed, in consideration of load and engine, the best run I had.

Coming up on the "Southern Belle," we had a 10-coach train of 48 axles, weighing 285 tons empty, and about 315 tons with passengers, the third-class Pullman and the non-corridor stock in rear of it being very full. Superheated "Atlantic" No. 426 was the engine, and so well within capacity was she worked that steam was blowing off almost all the way. Up the 1 in 264 to Clayton Tunnel we accelerated to exactly 40 m.p.h., but ran very moderately down to Wivelsfield, not exceeding 57½ m.p.h.

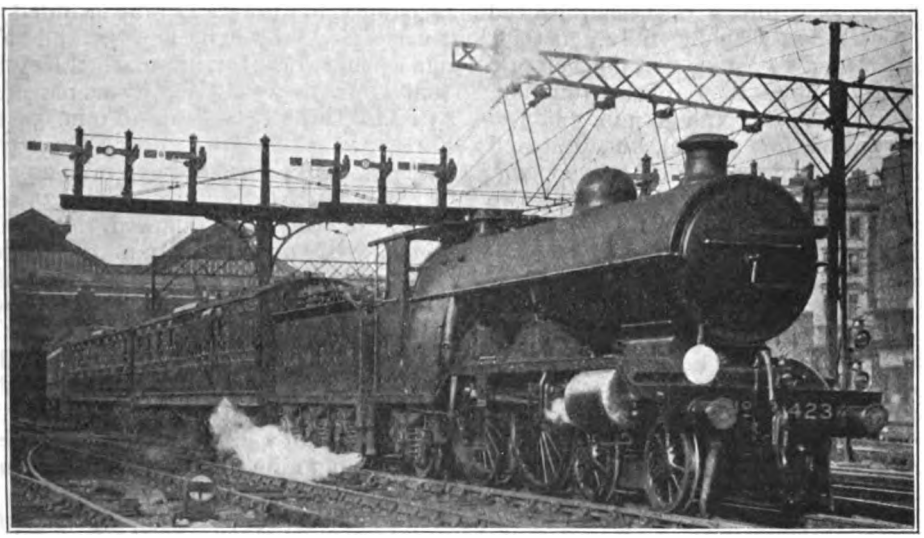

Photo.] LONDON, BRIGHTON & SOUTH COAST RAILWAY. [*F. E. Mackay.*

Brighton and Worthing express leaving Victoria. 4-4-2 superheater engine No. 423.

Hassocks, 7·1 miles, was passed in 13½ min., and Haywards Heath, 12·9 miles, in 19 min. 55 sec. The 8-mile bank up to Balcombe Tunnel (6⅛ at 1 in 264) reduced our speed to 47½ m.p.h., but a sustained maximum of 72½ followed past Horley, Balcombe Tunnel Box, 19 miles, being passed in 27 min. 40 sec., Three Bridges, 21·3 miles, in 30 min. 5 sec., Horley, 24·9 miles, in 33 min. 10 sec., and Earlswood, 29 miles, in 37 min. 10 sec. The ascent to Quarry begins at Horley, having an inclination of 1 in 264 thence to Earlswood, continued at 1 in 163–200–230 to the box, and at 1 in 206 thence to the far end of the tunnel, 1¼ miles distant. We entered the

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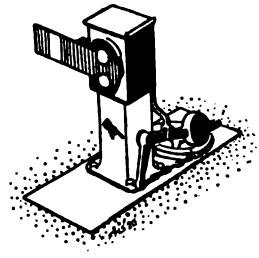
tunnel at 48 m.p.h. and left it at 45½, passing Quarry Box, 32 miles, in 40¾ min., and South Croydon, 39·4 miles, in 49 min. 10 sec., and running very slowly from Coulsdon, as we were before time. Then came checks all the way to town, apart from which we should have passed Croydon in a shade over 50 min., and reached Victoria easily in 65 min., 5 min. inside schedule. On this run, with 315 tons, we covered the 32·3 miles from Hassocks to South Croydon in 35 min. 40 sec., at an average of 54·4 m.p.h.

On the 11·55 a.m. from Victoria to Eastbourne, to my great surprise, we were horsed by one of Mr. Stroudley's 0-4-2 "Gladstones"—No. 180—but a load of ten 8-wheelers, and a 6-wheeler, packed with people and weighing fully 270 tons, proved rather too much for the veteran. We took 7¾ min. to Clapham Junction, 22 min. to Croydon, and 36 min. 5 sec. to Quarry (5 min. over time), but went well on to Three Bridges, despite a bad p.w.r. check beyond Earlswood, before which we had touched 65 m.p.h.; we passed Earlswood in 39½ min., and Horley in 44 min. 20 sec., reaching Three Bridges in 49 min. 5 sec., or 47½ min. net. The scheduled time is 45 min. Re-starting, we accelerated to 35 m.p.h. on the 1 in 264 ascent to Balcombe Tunnel, and touched 64½ m.p.h. at Haywards Heath, passing the latter place, 8·4 miles, in 13 min. 10 sec., and Keymer Junction, 11·6 miles, in 16 min. 25 sec., at a reduced speed of 30 m.p.h. After sustaining a speed of 66 m.p.h. on the falling grades to Lewes, we reached the latter town, 20·6 miles, in 28¾ min., against a decidedly difficult schedule of 26 min. For the concluding 15·9 miles to Eastbourne, including Polegate slack, we required 24 min. 25 sec., although allowed 23 min., the total loss attributable to engine being, therefore, 6¾ min. But as the intermediate timings of this train are equivalent to those of a non-stop 90-min. run from Victoria to Eastbourne, No. 180 had really not done badly with a substantial train.

The return running, on the 2·22 p.m. express, with a 10-coach train weighing loaded 265 tons, was rather poor; the engine concerned was a rebuilt 4-4-0, No. 318. We took 22 min. 40 sec. to pass Lewes, and 38 min. 25 sec. to Keymer, 24·9 miles, but the latter time included the usual crawl through Lewes, and also signals badly on as we approached Keymer Junction. Haywards Heath was passed in 44 min., Three Bridges in 56 min. 5 sec., Earlswood in 64 min. 40 sec., Quarry in 69¾ min., and Coulsdon in 75 min. 20 sec., Croydon being reached in 80 min. 35 sec., instead of the 77 min. allowed. Maximum speeds were only 64 m.p.h. at Horley, and 60 at Purley, with an intervening minimum of 35 at Quarry. Net time was about 79 min.—a loss to engine of 2 min.—but some amends were made after Croydon by a run to Clapham Junction, 7·8 miles, in 11 min. 10 sec. start-to-stop, instead of the 13 min. allowed, and another thence to Victoria in 5 min. 50 sec. instead of 7 min. So we regained 3 min., but this was, of course, with the Victoria portion of the train only.



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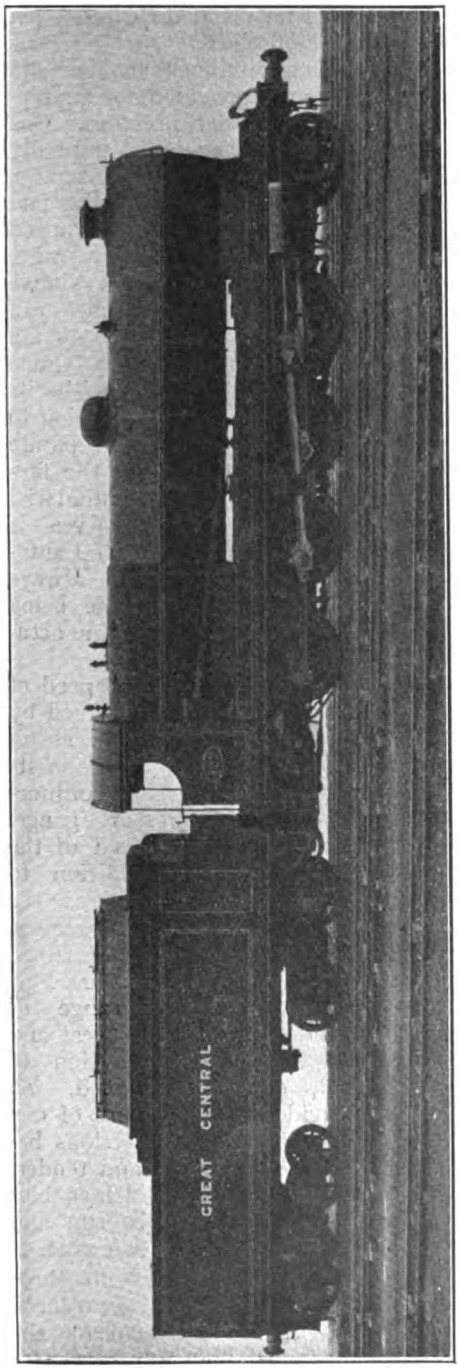
Locomotives for Special Fuels.



GREAT CENTRAL RAILWAY 2-8-0 LOCOMOTIVE, No. 422, FITTED FOR BURNING PULVERISED FUEL.

FOR some time past considerable attention has been given to the use of fuel in a pulverised form for locomotive engines, and many advantages are claimed therefor, not the least being the complete combustion thereby attained and the ability to utilise low-grade coal. Various special fittings are necessary on the engine, and by courtesy of Mr. J. G. Robinson, Chief Mechanical Engineer, Great Central Railway, we are now able to illustrate and describe the equipment he is employing on 2-8-0 engine No. 422, which has been experimentally adapted for burning pulverised fuel.

The fuel is contained in a special hopper built into the tender as shown, and falls by gravity on to two helical feed screws. These screws, when rotated, carry the fuel forward and deliver it into a chamber where it is met by a current of air under pressure, coming from the fan, and the mixture of air and fuel is projected forward through pipes and ejected from nozzles into mixing chambers under the footplate and connecting with the lower part of the firebox. Ignition of the fuel is brought about by opening the inspection doors and placing in front of the nozzles a piece of burning cotton waste, which has been previously saturated with petroleum, the doors being closed before the blast and feed of fuel is started. A further supply of air is drawn through the damper controlled passages, partly by the action of the central jet from the nozzles and partly by reason of the partial vacuum created in the firebox by the action of the ordinary steam blower and, when running, by the exhaust steam discharged from the engine blast pipe, and combustion of the mixture of air and fuel commences at the entrance of the combustion chamber at the base of the firebox.

A further supplementary supply of air enters by damper-controlled passages and passes up between the inner sides of the firebox and the brickwork forming the sides of the combustion chamber, and enters the latter on both sides of it through ports. This air, which is drawn

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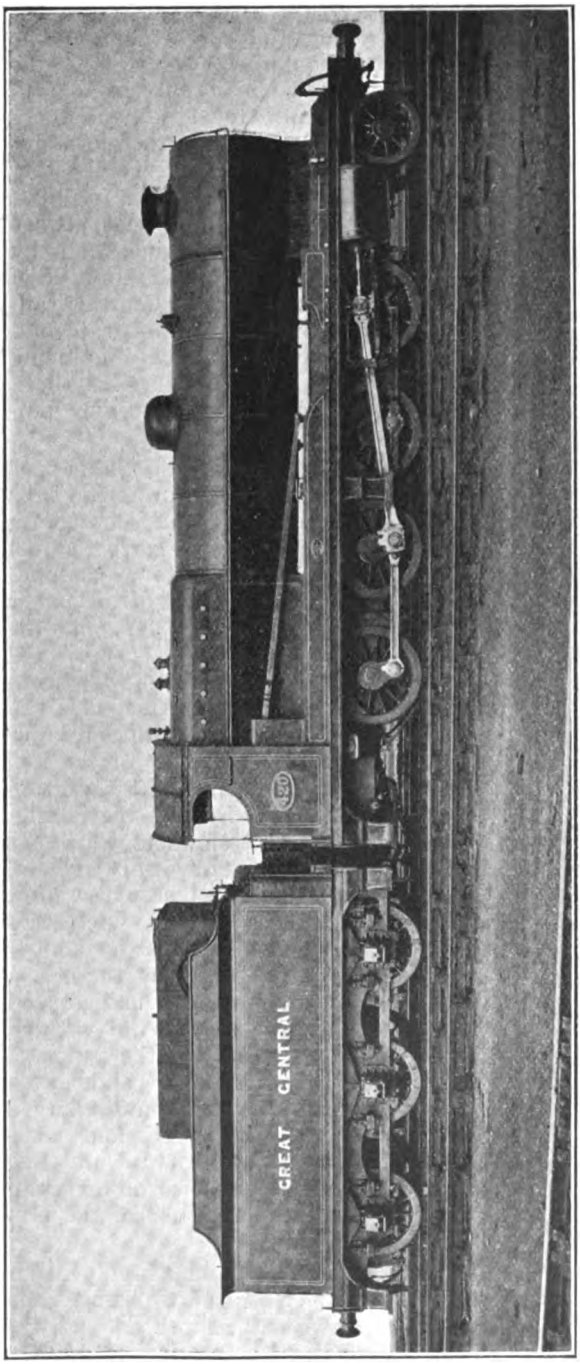

2-8-0 TYPE LOCOMOTIVE (No. 420), GREAT CENTRAL RAILWAY, FITTED WITH APPARATUS FOR BURNING COLLOIDAL FUEL.

in solely by the action of the blower draught, or the cylinder exhaust, in a number of small streams, rapidly combines with the fuel and facilitates its complete combustion in the firebox.

Two auxiliary engines and a fan are provided for supplying air under pressure. One auxiliary engine normally operates the fuel feed screws, and the other drives the fan, but the gearing is so arranged that should necessity arise, either engine, by a simple arrangement of clutches, can be made to drive the air fan and the fuel screws. Each engine is provided with its own steam pipe connection to the boiler, with a separate regulating valve on the firebox back. It is immaterial which of these valves is opened first, as a special automatic arrangement always ensures the fan engine being started before the engine actuating the fuel screws.

Regulation of the speed of the fan engine is achieved by varying the quantity of steam supplied to it by means of its regulating valve, in conjunction with a pressure gauge. For varying the speed of the fuel screws, in addition to throttling the steam at the regulating valve, a two-speed gearbox is interposed between the engine and the feed screw worms, and any range of speed, to meet the lowest and the highest consumption of fuel, can be obtained. To provide against failure of one of the flexible connections between the engine and tender, a device is fitted which enables both engines to be run and regulated on the other pipe.

In the driver's cab three regulating screws are placed above the footboard on the left-hand side; one operates the dampers which control

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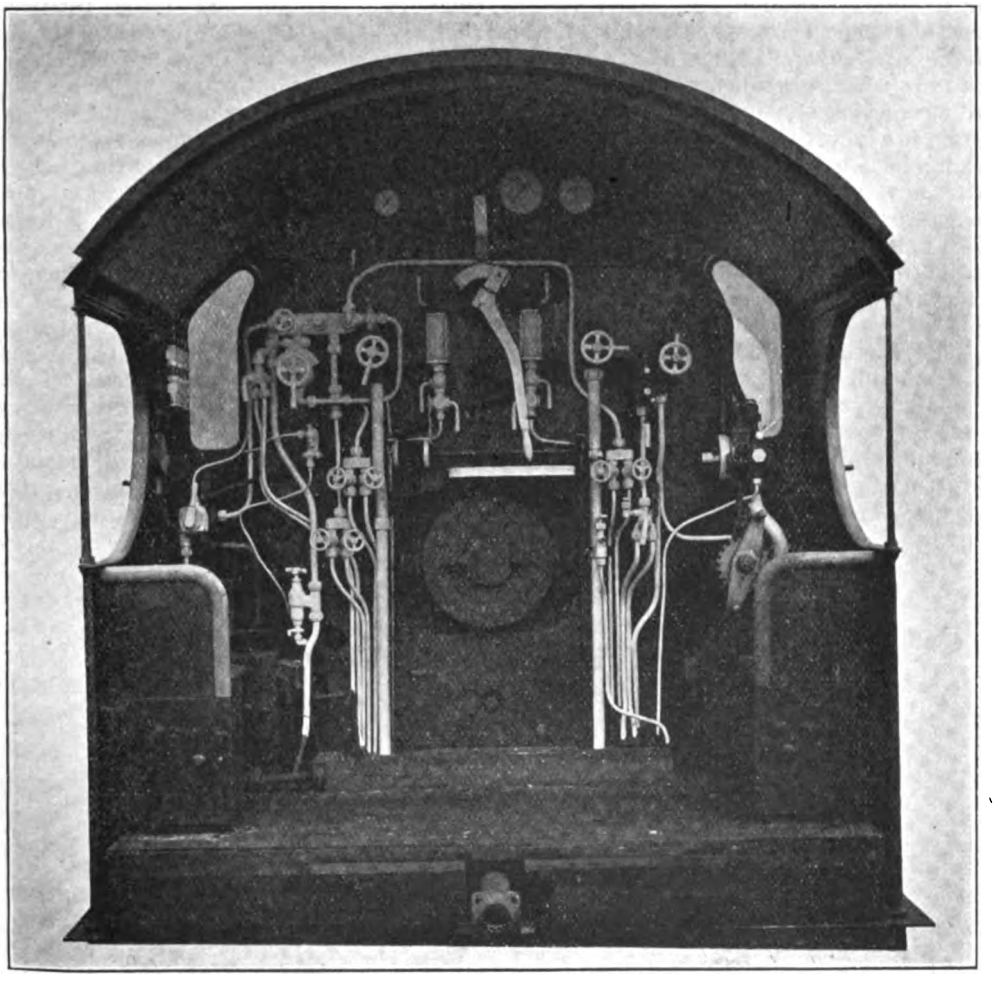
the admission of air to the chambers surrounding the fuel nozzles, and the other two control the dampers which regulate the quantity of air entering the combustion chamber through the ports.

Experiments are also being made on the Great Central Railway with a mixture of pulverised fuel and oil, described as "colloidal" fuel, and 2-8-0 locomotive No. 420 has been suitably equipped therefor. Comparative tests have been carried out between No. 420 ("colloidal" fuel), and No. 422 (pulverised fuel) and No. 419 (burning coal as usual), and by courtesy of Mr. J. G. Robinson we are able to refer to the results of these trials. No. 420 uses a mixture of 60 per cent. of pulverised fuel and 40 per cent. of oil.

All these engines are of the 2-8-0 type, with 21-in. by 26-in. cylinders and 4-ft. 8-in. diam. coupled wheels. The boiler barrel is 15 ft. long and 5 ft. 6 in. diam. outside at the firebox end. "Robinson" superheating apparatus is fitted, and as designed for coal burning in the ordinary way a total heating surface, including the superheater, of 2,123 sq. ft. is afforded. Grate area is 26 sq. ft. and the working pressure 180 lb. per sq. in. Tractive force of 34,237 lb. at 85 per cent. of the boiler pressure is exerted. With the standard tender the engine weighs 123·



FOOTPLATE VIEW, 2-8-0 ENGINE No. 420, BURNING COLLOIDAL FUEL.

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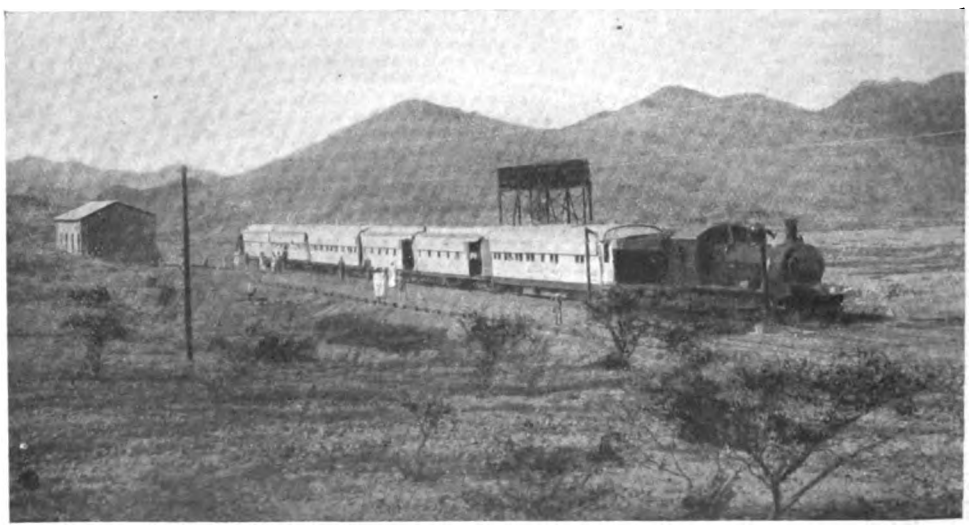
tons, with 67 tons 18 cwt. of adhesion weight.

The section of line worked over is that which extends from near Gorton, a mile or two from the London Road terminal station of the Great Central Railway, Manchester, to Dunford, immediately east of the Woodhead Tunnel. This section constitutes a practically continuous gradient, many portions of which are of considerable steepness. The actual tests began at Dewsnap Sidings on an up grade of 1 in 77, and subsequently the engines had to face grades of 1 in 86, 1 in 97, 1 in 100 and 1 in 117, with intervening lengths of, for example, 1 in 153, 1 in 143 and 1 in 122, &c., a total rise of about 700 ft. being reached in a distance of about 17¾ miles. The pull is thus a very severe one, requiring an output from the locomotive of a high character, probably in the neighbourhood of 1,100 h.p. or more.

The trains were made up of 80 empty wagons and one brake van in the case of engines Nos. 419 and 420, and 79 empties and one brake van for engine 422. In spite of the smaller number of vehicles in the last case the weight of the train was slightly heavier, whilst the tender of engine No. 422, with its fuel, weighed nearly 9 tons more than that of engine No. 419 and, roughly speaking, 3½ tons more than the tender of engine No. 420 carrying the colloidal mixed fuel. The gross weights of the trains, as the figures show, varied similarly, engine No. 419 with ordinary coal having the lightest total load, and 422 the heaviest, the difference between No. 420's train and that of No. 422 being relatively light.

Commencing at Dewsnap Sidings, a mile or two east of Gorton, engine No. 419, with ordinary grate, completed the distance to Dunford Sidings, 17 miles 1,320 yards, in 1 hour 23 minutes. No. 420 in 1 hour 14 minutes and No. 422 in 1 hour 29 minutes. The reason for No. 422 taking a longer time than the others was that the speed was slackened for a considerable distance for permanent way purposes. Thus the locomotive with mixed fuel completed its journey in the shortest time. The average superheat was higher in the case of the colloidal fuel locomotive than in either of the others, and there are other indications, from the details of the tests, which tend to show that this engine exhibited a certain amount of superiority over the others in the handling of its train.

IN THE SUNNY SUDAN.



TRAIN AT KAMOBSANA STATION, SUDAN GOVERNMENT RAILWAYS

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Post-War "Reconstruction" on the Great Eastern Railway.

A NEW CONTINENTAL SERVICE AND A NEW STEAMER.—ACQUISITION OF THE FELIX HOTEL, FELIXSTOWE.—"THE LAST WORD IN STEAM-OPERATED SUBURBAN SERVICES."

NOTWITHSTANDING that, owing to its geographical position, the Great Eastern Railway had so many of its ordinary public activities closed during the war period, while the enforced cessation of Continental traffic brought to a termination, for the time being, the forward policy in this respect which had characterised Great Eastern Railway enterprise during recent years, a remarkable degree of progress has been achieved since the reopening of the North Sea and the restoration of Anglo-European communications.

At various dates new Continental services via Harwich have been restored, and although the complete series of facilities operated before the war is not even yet available, much has already been done. A principal difficulty has been the need for new steamships to replace those lost during the war; but a few months ago a new geared turbine vessel, the *Antwerp*, was placed on the Harwich-Antwerp route, and a second vessel of the same design, the *Bruges*, has now been delivered by the builders, John Brown & Co., the well-known Clyde shipbuilding firm. With this vessel available, an improved night service for Belgium and Germany was inaugurated on Monday, October 4. A third vessel, the *Malines*, is due for delivery early next year, but meanwhile the *Antwerp* and the *Bruges* will enable the following convenient service to be operated daily except Sundays :—

London	..	dep.	8.30 p.m.
Harwich	..	arr.	9.58 ,,
		dep.	10.30 ,,
Antwerp	..	arr.	8.30 a.m.
		dep.	10.0 ,,
Malines	..	arr.	10.40 ,,
		dep.	10.45 ,,
Brussels	..	arr.	11.10 ,,
Louvain	..	,,	1.14 p.m.
Namur ..	..	,,	2.37 ,,
Liege ..	..	,,	1,55 ,,
Verviers	..	,,	3,23 ,,
Cologne	..	,,	7.25 ,,
Cologne	..	dep.	10.38 a.m.
Verviers	..	,,	1.59 p.m.
Liege ..	..	,,	3.0 ,,
Namur ..	..	,,	4,55 ,,
Louvain	..	,,	5.40 ,,
Brussels	..	,,	6.30 ,,
Malines	..	arr.	6.55 ,,
		dep.	7.0 ,,
Antwerp	..	arr.	7.35 ,,
		dep.	8.0 ,,
Harwich	..	arr.	6.0 a.m.
		dep.	6.30 ,,
London..	..	arr.	8.0 ,,

On Friday, October 1, a large party of officials of the Great Eastern Railway Company, representatives of the various Continental traffic agencies concerned, and of the technical and general Press on both sides of the North Sea, and others, travelled to Harwich (Parkeston Quay) for the purpose of inspecting the *Bruges* prior to her taking up the duties of the new service above referred to. The *Antwerp* has for some time been engaged on the Harwich-Antwerp route, but the improved facilities could not be inaugurated until at least two vessels were available.

The *Bruges* is 332 ft. long, 43 ft. broad, and height from keel to shelter deck is 26 ft. 6 in. Registered tonnage is about 3,000 tons. The geared turbines with which it is equipped develop 12,500 h.p., and give a speed of 21½ knots.

As the service these new vessels are engaged in is a night one, cabin accommodation has received special attention. Berths are available for no fewer than 263 first-class and 102 second-class passengers, the higher class being largely accommodated in single or double-berth cabins, together with the usual four-berth cabins, the former being, however, unusually numerous. Both first and second-class sleeping cabins are beautifully equipped, while the general accommodation is of a high order. Ventilation and safety measures have received special attention, and the *Bruges* and her sister vessel are

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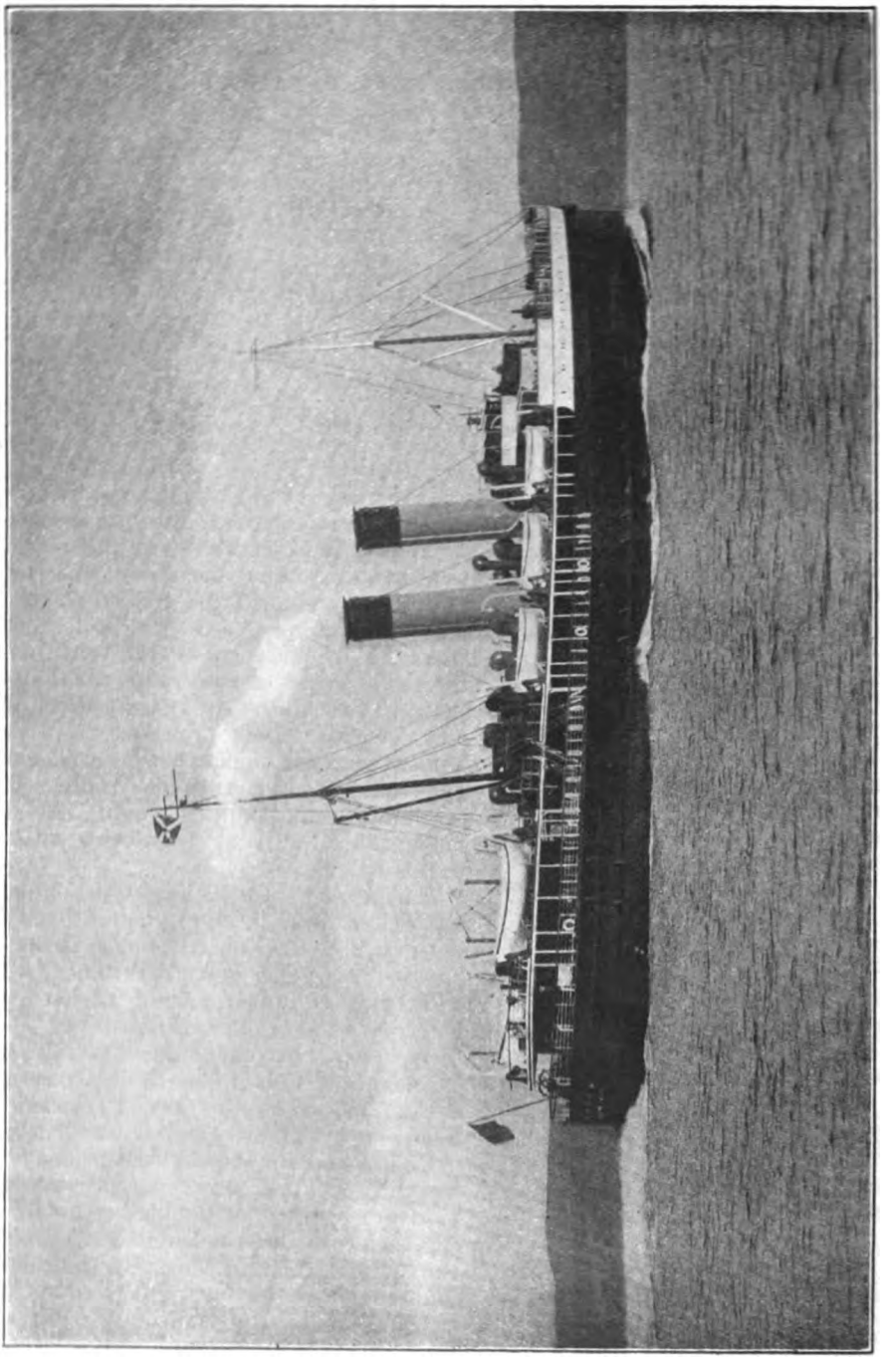

NEW GEARED TURBINE STEAMSHIP "BRUGES" NOW RUNNING IN THE HARWICH-ANTWERP SERVICE.

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designed in accordance with the latest shipbuilding and marine engineering practice for steamers for short passages, mainly by night.

On the boat deck, at the forward end is the Royal cabin, a bed-sitting room splendidly equipped and with many conveniences suited to its special purpose. At the head of the main staircase is a vestibule fitted up as a lounge. Overhead is the navigation bridge, chart-room and captain's quarters. The wireless room is at the after end of the boat deck.

The upper deck includes reception hall, chief steward's office, and (forward) the handsomely-panelled dining saloon, with accommodation for 72 passengers. The prevailing colour note of the decorative scheme is white and pale grey, as also in the ladies' room. A special feature is made of the open fireplaces (electric, in imitation of coal fires) in the various saloons. On this deck, forward, are a number of first-class cabins, and baggage room, while aft is the smoking room, notable for its large windows, domed roof and oak wainscotted walls and comfortable lounges. Adjoining is a service bar. Beyond is a series of cabins, including 16 single-berth rooms. Nearer the stern is a smaller deck-house, containing the second-class smoking room and—a new feature—a second-class ladies' room.

Forward on the main deck is a long range of cabins extending to the ladies' saloon, a beautiful apartment—rather, a ladies' boudoir. At the after end is the second-class saloon for 40 passengers, together with second-class cabins.

Catering is conducted directly by the company, and a feature of the kitchen is that electric appliances are almost exclusively employed.

Ventilation is on the Thermo-tank system, ensuring a supply of equally-heated or cooled air (according to season) throughout the cabins and saloons. In the first-class sections the thermo-tanks are arranged in pairs.

Motive power is provided by two sets of Curtis-Brown geared turbines, driving through Michell thrust bearings.

The *Bruges* is equipped with complete wireless and submarine signalling appliances, and is fitted throughout with the Stone hydraulic door-control system, applied to every bulkhead opening throughout the ship, thus dividing it into ten compartments, the division walls being carried right up to the shelter deck. Each door has, however, local control, allowing passage after the doors have been closed, though no doors can be left open.

The service upon which the *Bruges*, together with the *Antwerp*, is now engaged is a particularly convenient one for passengers to or from the Continent. Leaving Liverpool Street at 8.30 p.m. by the special boat train, dinner can be taken on the journey. At Parkeston Quay, Harwich, there is a covered way from train to boat; leaving Harwich about 10.30 p.m., the night is passed on the steamer instead of on shore, so that the journey takes nothing from the working day, and passengers arrive in the Scheldt early next morning in time to dress leisurely and breakfast before landing on the Quai du Sud. In the other direction a *table d'hôte* dinner is served on leaving Antwerp, while the vessel is proceeding down the river. Arriving at Harwich about 6 a.m., breakfast is served on the up train, and London is reached at 8 a.m.

Last session the Great Eastern Railway Company promoted a Bill in Parliament to enable them to acquire the Felix Hotel at Felixstowe. This purchase has now been completed, and, after inspecting the *Bruges*, as above described, the party crossed the Orwell to Felixstowe by one of the Great Eastern Railway's fleet of river steamers, thence proceeding to this, the latest addition to the company's notable series of first-class hotels. The Felix hotel, probably the finest on the East Coast, should, in the hands of the Great Eastern Railway, prove even more popular than it has in the past. It stands high on the cliffs, with terraced gardens sloping to the beach, and enjoys seawards a full southern aspect.

Felixstowe, one of the sunniest places on the East Coast, is easily reached from London by a convenient service of express trains, the journey being accomplished in about two hours. To this fact is due its increasing popularity as a week-end resort of city men and others. Its facilities for sport include a fine sporting 18-hole golf course, grass and hard tennis courts, and croquet lawns, while, after October, the sea fishing is usually very

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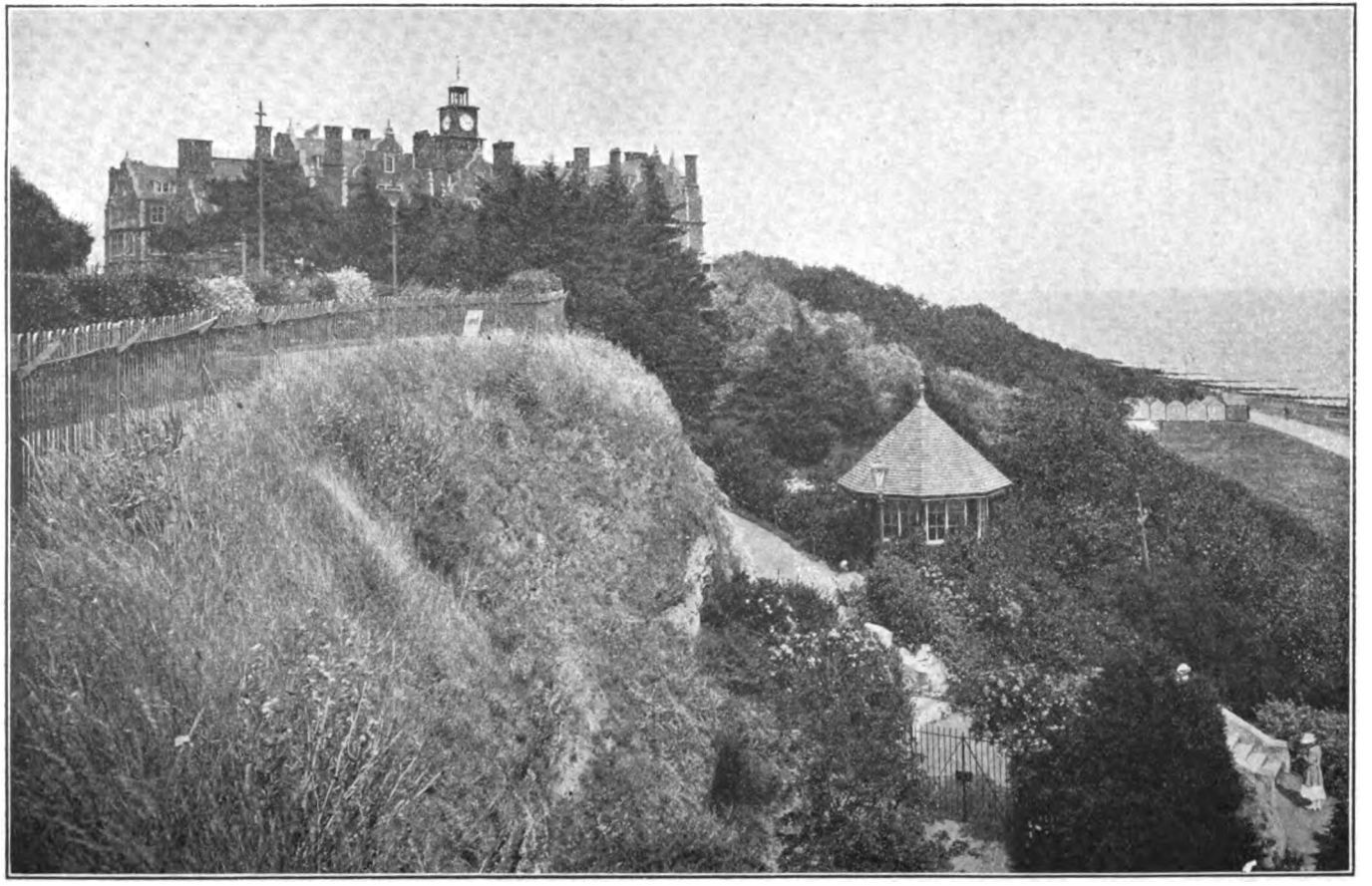

Photo.] [*Photochrom.*

FELIX HOTEL, FELIXSTOWE, RECENTLY PURCHASED BY THE GREAT EASTERN RAILWAY COMPANY.

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good. With regular steamer services across the river from Harwich, Felixstowe is equally convenient for visitors from the Continent.

The acquisition by the Great Eastern Railway Company of the Felix hotel is an additional attraction to Felixstowe, for this well-known hotel is deservedly considered the finest and most luxuriously furnished on the East Coast. It possesses 250 rooms. The ground floor is designed on a spacious scale and most conveniently arranged. All the rooms are tastefully decorated and appointed. Throughout the building there is very fine carved woodwork; in the front hall a handsomely-carved oak staircase especially attracts attention, while a valuable collection of antique furniture adds considerably to the dignity and attractiveness of the fine rooms. The winter garden, or palm court, is beautifully decorated in the early Georgian style, and the wide "couloir" surrounding it gives convenient access to the various public rooms. The dining room, in the later Georgian style, is a magnificent room, seating 200 persons, while in front and towards the sea there is a restaurant seating about 80. The Elizabethan ball room is oak-panelled all round the walls, and, in addition to having two fine carved mantelpieces and a splendid oak floor, has the national emblems of England, Scotland and Ireland glazed in colour in the windows. The smoking room, reading room and lounge are also richly decorated.

When the Felix hotel was originally opened the lady performing the ceremony said that the best wish she could express for the future of the hotel was "*Ut Omnes Veniant*" ("Let them all come"), and this motto, appearing over the front entrance, represents very aptly the spirit in which this beautiful hotel is conducted.

At a luncheon served in the palatial dining room of the hotel, Colonel Galloway, on behalf of the directors of the Great Eastern Railway Company, welcomed the visitors. Referring to the close relations which the war has created between England and Belgium, he recalled the murder of Captain Fryatt, whose body lay only a short distance away in Dovercourt churchyard, of the Great Eastern Railway steamer *Brussels*. Explaining that for the time being the company was concentrating upon the Antwerp service, for which the *Bruges* and her sister vessel were expressly designed, he mentioned also the opening of new offices in Brussels, 41, Rue Adolphe Max, and in Paris, 2–4, Rue Edouard VII, designed to facilitate traffic via the Harwich-Antwerp route with all parts of Europe.

In regard to the Felix Hotel, he looked for wide support, during the winter months, especially from the week-end visitor, in view of the many attractions Felixstowe has to offer, not the least being the magnificent hotel where they were now enjoying Great Eastern Railway hospitality.

Great Eastern Railway directors and officers present included:—Colonel W. J. Galloway, Mr. H. T. Bailey, directors; Mr. S. A. Parnwell, Assistant General Manager; Mr. C. Busk, Continental Traffic Manager; Mr. G. F. Thurston, Secretary; Mr. T. Chew, Solicitor; Mr. C. M. Stedman, Chief Assistant to Superintendent of Operation; Mr. E. A. Evans, Publicity Department. Also the following:—Mons. de Kerdvea, London Representative of the P.L.M.; Mons. Defrance, London Representative of the Belgian State Railways; Mr. H. M. Snow, M.V.O., Agent General in London, International Sleeping Car and European Express Trains Company, together with representatives of the technical and general press on both sides of the North Sea.

While referring to Great Eastern Railway enterprise, we may also recall the new suburban services, inaugurated on July 12, in regard to the Chingford, Enfield and Palace Gates routes. These were reviewed in the August RAILWAY MAGAZINE, but our contemporary, the *Railway Gazette*, devotes its issue dated October 1 to a detailed description of all this has involved in the way of engineering, signalling and operating developments. Illustrated with a remarkable series of photographs, drawings and diagrams, "how it has been done" is fully explained.

Commenting editorially, the *Railway Gazette* expresses the opinion that this new development is the cleverest thing that has been done in railway operation since Mr. Cecil Paget introduced the train-control system on a large scale on the Midland Railway. Admittedly an

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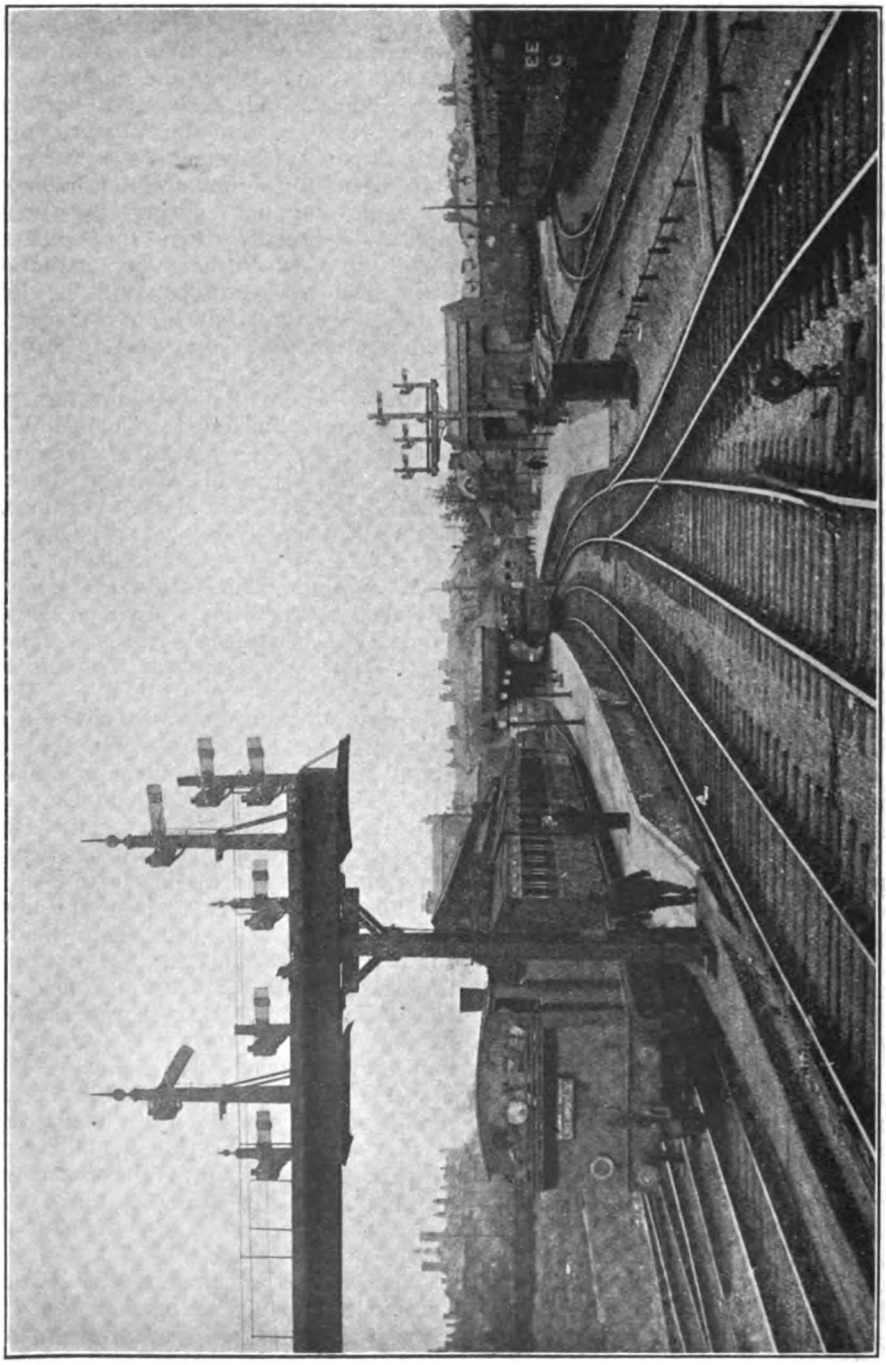

ENFIELD TOWN STATION, SHOWING NEW PLATFORM AND SIGNALS.

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expedient for the time being, for electrification alone can entirely meet the needs of the situation, it has been proved practicable to increase train facilities where, according to accepted ideas, "not another train could be squeezed in," by from 50 to 75 per cent. As a result, no fewer than 24 trains are operated hourly, in the crush periods, over each down and up "suburban" line, between Liverpool Street (platforms Nos. 1 to 4) and Bethnal Green, by means of existing steam engines and rolling-stock, the former being by no means as powerful as one would wish, the great majority being small six-coupled tanks weighing only 32 tons (empty), and of a design inaugurated as far back as 1886; controlled by manual signalling, operated only in ways which come strictly within the limits of ordinary practice; and involving track and station alterations which did not call for heavy expenditure on materials and labour.

In fact, it is estimated that the total cost involved does not exceed £80,000, a very reasonable figure in view of the results realised.

Four trains are now operated during the "crush" periods over the suburban lines between Liverpool Street and Bethnal Green in each 10 minutes, two towards Enfield and Palace Gates, and two towards Walthamstow and Chingford. This requires substantially a two-minute headway on both the up and down roads, no mean undertaking where signalling is operated manually, and the necessary corollary is a degree of non-stop working in order that trains may obtain greater headway down the line. As a result, every train during the busy period—indeed, throughout most of each weekday—is given at least two or three "pass" stations, and the train services as a whole are worthy of careful study.

These results have been achieved by concentrating attention upon (*a*) terminal improvements to obviate all possible causes of delay there; (*b*) signal improvements to accelerate train movements and clearance and to keep trains moving, although a clear road cannot be given, and (*c*) intermediate track alterations designed to assist the running of trains, and to utilise multi-track facilities, as far as they exist, in the best manner possible.

The following is a general review of the principal measures involved:—

(1) Re-locating contacts to give earliest practicable clearances.

(2) Placing certain contacts nearer to the signal they control, and fitting wheel-bars so that the delayed action effected by the latter is proportioned to the length of the train, whereas previously it did not become operative until the engine had reached the contact, whether running light or with a long or short train. This alteration is of special value where contacts had been placed to suit lengthy main line passenger or goods trains.

(3) Track-circuiting selected sections of line, where the rule that a signalman must see the rear of a train before operating his instruments would involve delay, owing to the location of the box; to safeguard "breakaways," and generally to speed-up the working. In some cases it is provided in combination with rail contacts and wheel-bars.

(4) Re-positioning certain signals, especially the homes, and, in quite a number of instances, adding new outer homes and moving the original ones further in to form inner homes, together with re-located or new advanced starting signals.

(5) Adding check contacts to certain outer home signals so that a train, after being checked when approaching an outer home signal, releases the front lock of the lever governing that signal, thus allowing it to be lowered to admit a train to the inner home signal (or to the starter or advanced starter). This measure possesses considerable value, as it frequently happens that the train need suffer no further delay, as the signals ahead can often be cleared before it reaches them. Incidentally, the signalman behind is thus enabled to permit another train to follow, whereas otherwise he would have to hold it. In effect, while maintaining the principles of correct "lock-and-block" working, each station is made into an intermediate section through which a train can be passed from signal to signal, but in nearly all cases with at least two protecting stop signals to safeguard a train in rear, pending clearance of the complete block section it is entering. This is an important facility on all sections in view of the close headway at which trains run during the busy period, but is

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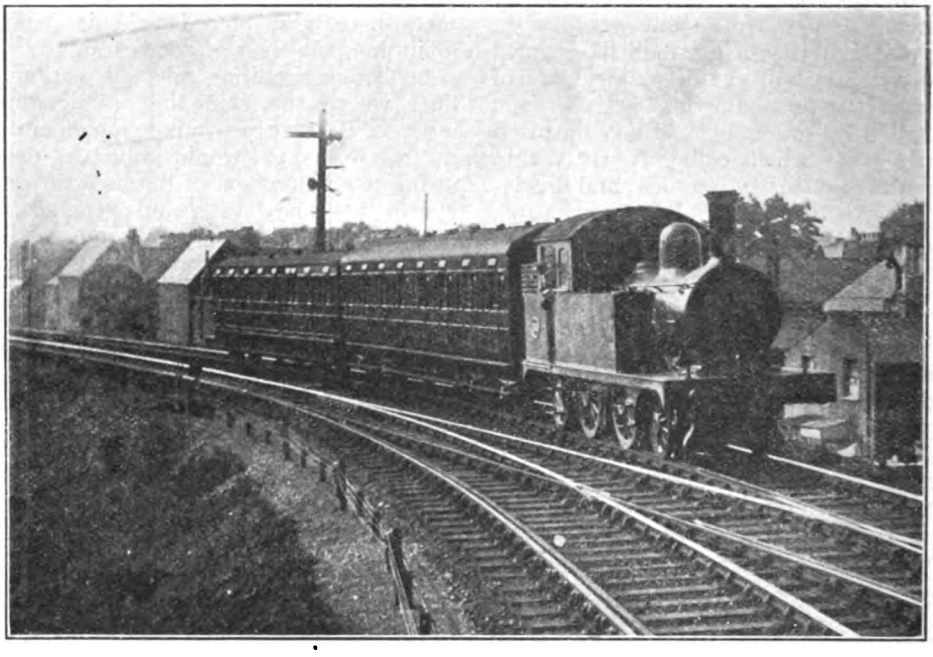
of special value on the ascent of Bethnal Green bank, where the gradient is 1 in 70, and where all trains of the "intense" service have to use the same line.

(6) To ensure that a signal is placed to danger promptly as a train passes, additional signals have been fitted with reversers, operated by rail contacts, thus restoring the signal automatically, giving the signalmen in busy boxes much appreciated relief, though it is still necessary for the levers to be returned by hand.

(7) In several places, as on the tunnel section through Bishopsgate, on curves, and where the view ahead is restricted, electric banner or repeating light signals are fitted. These repeat the next stop signal ahead, and are quite distinct from the distant signals provided as usual, but they have considerable value, as a driver is informed of the condition of the stop signal immediately ahead of him, although it may not be possible to clear the "distant" signal for him.

During the busy periods the through Liverpool Street–Palace Gates trains alternate with connections on the branch, maintained by two "auto-trains," each consisting of a small tank engine and two bogie coaches, at the rear of which is a driver's compartment with compressed air equipment, whereby he has control of the regulator on the engine, as well as of the brake and whistle. These also run at other times to maintain frequent connections with through Enfield trains. To meet the conditions of the location SYX. electro-mechanical train-stop apparatus is fitted, the up distant and up home signals on the Palace Gates branch at Seven Sisters being equipped with ramps between the rails, wth an emergency stop ramp along the platform to safeguard possible over-running of the proper stopping position.



"AUTO-TRAIN" ENTERING SEVEN SISTERS STATION.

Admitted by "Calling-On" Arm in conjunction with "SYX." Electro-Mechanical Train Stop Apparatus.

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The Travelling Post Office.

By T. CHANDLER.

THE words "Travelling Post Office" convey to one's mind a certain fascination, especially to anyone who has not experienced life on a T.P.O. And even to one who has done so the fascination is still felt.

To the casual observer the life is looked upon as one of comparative ease, and he has been somewhat surprised, on having an opportunity of seeing things for himself, at the arduous duties that have sometimes to be carried out. I have often heard the remark passed by passengers on the platform, "I had no idea they had to work so hard." This, indeed, speaks for itself.

As one enters a Travelling Post Office, or Sorting Carriage, almost the first thing that strikes one is the amount of padding used on the insides of the carriage. This is provided to lessen the danger of minor injuries which might be sustained on being thrown by the lurch of the train. This happens often on a man's first journey, but after a time the curves and points encountered by the train become known to him, and he becomes more wary. One also notices, on entering the carriage, the series of numbered "pigeon-holes" or boxes; these are built in the sides of the carriage and are both large and small. The numbers take the place of the names of towns, &c., for which the letters are destined and have to be sorted accordingly. It would not be possible to mark them with the names of towns, owing to the frequent change in the circulation of correspondence. The small boxes are for small letters, and the large ones for long letters, newspapers and packets. At the finish of the duty these boxes have to be examined with the aid of a lighted taper, to see if any letters have been left. Should any letters escape the eye of the searcher and subsequently be found by the carriage cleaner, then a small fine is imposed on the searcher for every item so found. The lighting of a sorting carriage is either by incandescent gas or electricity, and heating is usually supplied by steam pipes from the engine. Drawers are fixed underneath the sorting tables, in these are contained the stores which will be required on the journey. The compact arrangement of things in general will no doubt commend themselves to your notice.

We will take an imaginary trip on one of these travelling post offices—not on the largest of them. Whilst the passengers are comfortably ensconced in spring-seated compartments, the men in the sorting carriages are all ready to start on their spell of duty. The mail bags are hanging at the side of the carriage ready to be filled, in the order in which they will be despatched. The apparatus man here takes the opportunity of testing the "net," which process is curiously scrutinised by onlookers who may be on the platform. A few bags now come along the platform on a trolley; these are thrown in and divided, some to be carried intact to destination, others to be opened in the "sorting carriage." At this stage the bag-opener starts upon his work, and when he has opened the bags the letters are passed over to the other officials who cut open the sectioned bundles and commence to sort.

The clock points to three minutes of the starting time of the train; nearly all the mail bags are "on board." The men have got into stride almost without noticing the interested approval of the onlookers; this is probably the first time they have seen the interior of a mail van in working order. The hands of the clock now point to one minute of the starting time, in the distance a cry can be heard "Mind your backs, please!"; a porter suddenly emerges from a crowd of passengers pushing a trolley with the last few mail bags. These are hastily thrown in, and even as this is done, the guard's whistle is blown, the green lamp is shown to the driver, and with the usual warning the train puffs out of the station, on its night-journey northwards.

Our door having been closed, we turn and watch the inner workings of the T.P.O. You will find two of the men piling bags on their respective stacks; time did not

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permit of this being done whilst in the station. This carriage is known as the stowage van or bag tender, from which the mail bag apparatus is worked, and our friend who works the exchanging equipment is busy with incidental jobs until he reaches the first apparatus mark.

The mail bag apparatus is used on nearly all travelling post offices, and is not only most interesting but provides at the same time one of the hardest duties that have to be covered.

A man taking up this duty as a novice is given a number of journeys under a tutor; after a time he is tested by an examiner from the Travelling Post Office branch of the General Post Office. The test is thorough, and the candidate must be able to despatch and receive mails from one door unaided, and to answer any questions appertaining to the safe working of the mail bag apparatus. and—which is most essential—he must know the "road" well, *i.e.*, all the landmarks which give him a guide to his whereabouts. Signal-boxes, road-bridges, rivers, villages, cuttings, level-crossings, these are some of the guides, all of which must be familiar to him. In time a man gets to know the "road" as much by sound as sight; indeed, in foggy weather sound is the chief guiding factor, as land-marks are then almost impossible to discern.

A bracket post or standard is fixed at the side of the line at certain places, and it is from these standards that the pouches containing the mail-bags are suspended. As the train approaches the standard, the net on the train is opened by means of a lever controlled from inside the carriage; this, coming in contact with the hanging pouch causes the pouch to be knocked off. The pouch falls into the net and thence into the carriage. Whilst this is taking place a similar exchange is being effected; the pouches suspended from the approaching train come in contact with a "ground-net," which receives them when knocked off. When the net is opened to receive a pouch or pouches, a bell is automatically rung in the carriage, giving warning to the men in the sorting carriage to prevent them coming into the apparatus carriage, because in doing so they would have to cross the path of the incoming pouch, and the average weight of the descending pouch would be sufficient to cause fatal injury. It must here be borne in mind that the train is travelling at express speed, and the concussion caused by the exchange of pouches is so great that at times the pouches enter the carriage ripped at the back, thereby exposing the canvas mail-bags to view. Mail-bags which have to be despatched by apparatus must be enclosed in a pouch and securely strapped before being fixed to the "extending arm"; this is done to minimise the risk of damage to correspondence contained in the mail-bags. It does not always follow, however, that because mails are despatched by apparatus, they are received by apparatus, and *vice versa*.

Having left London about 20 minutes, preparations are made for receiving mails by apparatus. The "apparatus" door is opened, the net unhooked, and the bell adjusted. A look-out is kept by the apparatus man and, immediately on passing a white board at the side of the line, he opens the net. Now he waits; a dark object is seen to pass the window, the next moment it rolls into the net and thence bundles heavily into the carriage. The net is immediately closed. The "dark object" is a pouch; it is being opened by the apparatus man, and the mail-bag within it is then transferred to the sorting carriage, there to be opened by the bag-opener and the contents sorted by the other men. The apparatus man then returns to his carriage, and continues with his minor jobs, until nearing his next apparatus mark, there to adopt the same procedure as before.

This time, after having taken the mail-bags through to the bag-opener he returns and "makes up" a pouch containing two mail-bags, to be despatched at the next apparatus mark, which is now within two minutes' run. He proceeds to fix the pouch in readiness on the suspending arm and waits. The white board is passed; immediately he opens the net and simultaneously puts out the pouch, which is now hanging from the extending arm. In another second a double bang is heard, this being caused as our pouch falls into the wayside net, and two pouches come flying into the carriage and lie on the floor awaiting the attention of the opener. After the net has been closed, these pouches are unfastened and the mail-bags extracted; one to be opened in the "sorting carriage" the other to be placed in another pouch to be despatched at the next mark.

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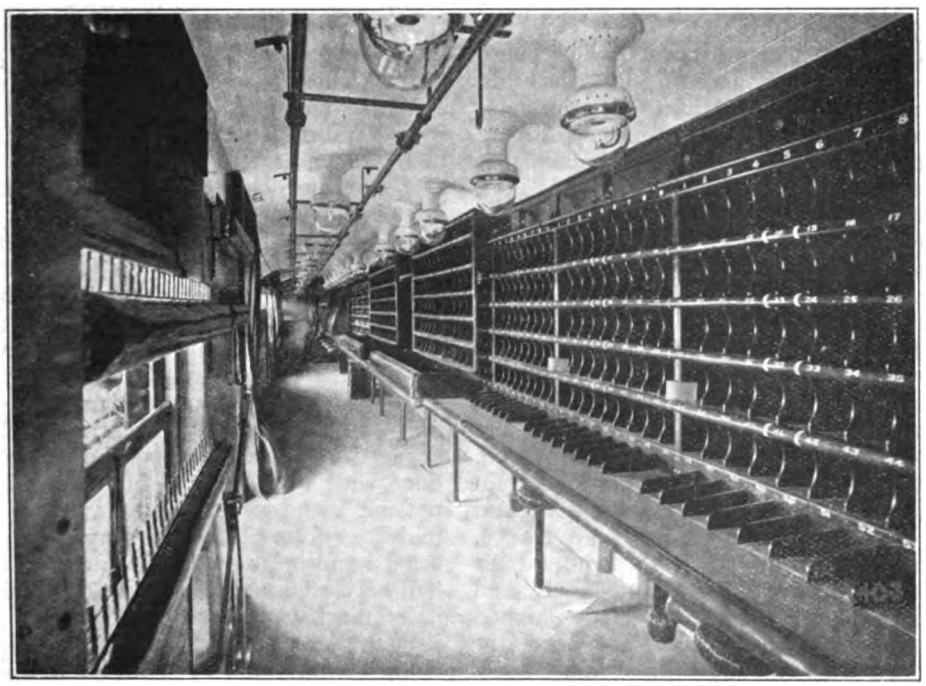
All this time the men in the sorting carriage are working hard sorting letters and newspapers; and, take hardly any notice of each successive bang as the pouches come flying in. Neither do they appear to observe the speed of the train as it goes rushing on, over points, through stations, over bridges, under bridges, and through tunnels, the sorters placidly sorting, filling the pigeon holes with hundreds of letters.

Now the brakes are applied; the men take firmer footing, and perhaps hold on with one hand, until the train is brought to a standstill with a jerk. Occasions such as these, of course, are of momentary duration, and the men "carry on" with the sorting almost without delay.

The pigeon holes in front of each man now present a different appearance from that which we observed on entering the carriage at London. Some are overflowing with letters, some half full, and others contain only a few letters; but they show creditable results for the men who have been on duty.

The final apparatus exchange has taken place, and we have a run of 20 minutes to our first stopping station. An extra spurt is now put forward as the men realise that, so far as this stage is concerned, all the work is in front of them. Hardly anyone speaks, all being intent on the same thing—a clear finish. The train gives a swerve as it rounds a curve and the staff lurch jerkily, but that is all. The sorting still goes on, and now we are within five minutes of the station. The sorting is finished. A few words are now exchanged between the men, but their activities do not cease on this account; they are busy tying up bundles of letters as taken from the pigeon holes and dropping them into the mail-bags, which are suspended open in readiness to receive them. When everything is inside the bags, they are tied, labelled and sealed—the last one being sealed as the train enters the station.



INTERIOR OF POSTAL SORTING CARRIAGE: WEST COAST JOINT STOCK.

Here the apparatus man despatches and receives mail bags proper to his door and, when received, stacks them according to the station at which they have to be put out. When this is finished he re-enters

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the sorting carriage and commences to sort newspapers, and continues to do so until the finish of the duty, with intervals at each stopping station for despatching and receiving mail bags. Almost a repetition of this working is gone through at each stage of the journey. The men sort the letters and newspapers, the mail bags are sealed, then despatched; more mails are received, and so on until the finish. With the final unloading at the terminal station the staff have finished duty. Where the number of men warrants it, an overseer is in charge, who is responsible for the effective working of the staff on duty.

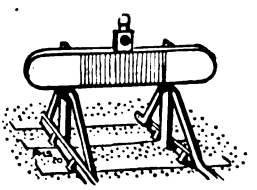
At times incidents occur, which more often than not account for the late running of the mail train, sometimes by as much as 60 minutes or more. Among them may be instanced; the breaking of a draw-bar or coupling, failure of brakes, fouling of points, engine trouble, and slow travelling which may be due to various reasons. Should either of these occur previous to a scheduled long stop at a station, there is a possibility of the greater portion of the time being made up. This however, is not to the advantage of the men on the mail train. It often means a scramble to get the mails out and in and also a close finish at the terminal station.

At the finish of the journey a certain satisfaction is felt when looking around the carriage. All pigeon holes are empty, all stores locked away, the floor perhaps littered with used string and labels, and a pile of mail bags ready to be despatched at the terminal station. The spectator wonders where and how the work has gone. The answer, however, can be supplied by a glance at the bags ready to be despatched.

A large number of men are constantly employed on travelling post offices every night throughout the year. For what purpose you may ask? Chiefly to help carry on the commerce of the country, and to enable men and women to have their correspondence brought to them at the breakfast table every morning. It would be interesting to know if ever a thought is given to the men who are working through the night, keeping open the lines of communication. In all weathers and travelling mostly at express speeds, sometimes working at express speed—indeed, it is all more or less a race against time.

While the general public is comfortable in bed and regardless of the weather, these men are perhaps nearly frozen with the raw morning chilliness, especially if no heat is allowed to come through from the engine. And how fares the apparatus man? Constantly on the watch and straining every nerve to catch a passing glance of a land mark, lest he should miss the mark, hands in his pockets to prevent them being nipped by the frost, perhaps standing on an improvised mat to save him slipping out of the carriage whilst engaged in despatching pouches, with the door wide open with a full view of the passing country and only an iron bar midway across the doorway. On the other hand he may be working with only half his clothes on, as the heat of the night is too much for him.

Such then, is a brief account of the inner workings of one of our least known branches of the postal service.



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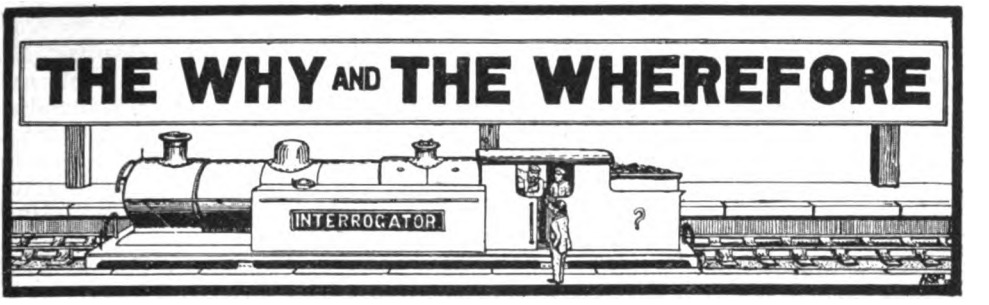

RAILWAY MAGAZINE readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o RAILWAY MAGAZINE, 30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book," for the current year. Price 5s. By post 5s. 9d.

Railway Brakes.

Various railways experimented with both the Westinghouse and the vacuum brakes of the period, and in 1875 the celebrated Newark brake tests were conducted, in conjunction with the work of a Royal Commission. It was, however, not until a few years later that continuous brakes became general, while they were not made compulsory until 1889. The Westinghouse was most in favour in early days, and several railways which now use vacuum brakes, at first employed the former, the latter being in an early stage of development at the time of the Newark brake trials. By 1889, however, the situation in regard to brake system employed was very nearly that which applies to-day.

[Reply to T. G.]

North and South Western Junction Railway.

We are informed by Mr. G. N. Ford, London District Superintendent, London and North Western Railway, that this line, authorised 1851, opened for goods traffic February 3, 1853, and for passenger traffic August 27, 1854, was at first worked by arrangement by the London and North Western and North London companies. Commencing 1866, the North London Railway provided passenger trains, running through to Kingston until 1868. From January 1, 1869, the trains were transferred to Richmond, via the Richmond Extension from South Acton.

[Reply to V. B.]

Locomotive Renumbering, Great Western Railway.

Your remark that 4–4–0 engine No. 7, *Armstrong*, was observed near Wolverhampton, apparently withdrawn from service, is noted. The renumbering carried out a few years ago brought together similar locomotives into definite numerical series. In several cases engines now bear numbers suggestive of those they originally bore. Thus, No. 40, *North Star*, as the initial four-cylinder engine, is appropriately No. 4,000, and No. 100, *William Dean*, the first two-cylinder 4–6–0 express engine, No. 2,900.

[Reply to "SHOOTING STAR."]

Speed on the London Electric Railway.

Most of the electric trains working round London are designed for average speeds on the more favourable sections of about 35 m.p.h., though this is, of course, exceeded in suitable places at times. Higher speeds would certainly not be made on the underground sections where an odd station is passed, as the headway is usually so close that "non-stop" trains must be held in to avoid being checked by signals. The best running is usually made when they get further out and stations are further apart and trains less numerous.

[Reply to C. E. B.]

4-4-0 and 4-6-0 Engines, Great Central Railway.

"Sir Sam Fay" class 4–6–0 engines are more powerful than the 4–4–0 "Directors," but probably less well suited to

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fast running. Consequently the former work principally over the heavier grading north of Nottingham, while the "Directors" are confined mainly to the Nottingham–London section, where higher speed is required, but the grading is, generally speaking, easier. These are not, however, inflexible rules, as a "Fay" may frequently be seen on the 8.45 a.m. from Marylebone to Manchester.

[Reply to "ATLANTIC."]

Midland Railway Locomotive Classification.

It would be quite impossible for us to detail the whole of the Midland classifications in these columns. In brief, there are four classes, the division of the express engines, in which you are doubtless most interested, being:—Class 1, 2–4–0 and 4–2–2; Class 2, rebuilt and other 4–4–0's numbered below 600; Class 3, large-boilered 4–4–0's of the Johnson type, numbered in the 700's; Class 4, compounds and the "999" class. The class number of all Midland engines is given on the cab sides.

[Reply to "MANCUNIAN."]

"Switching-Out" Signal Cabins.

On the line you specify certain signal cabins are "switched out" on Sundays or at times when traffic is light. The electrical connections are then completed through to cabins on either side, and the signalling section correspondingly lengthened. Signals controlled by the cabin switched-out are placed in the clear position for through running, as they cease to apply for the time being. Were they left at danger drivers would have to pass signals against them, which is, of course, not permissible.

[Reply to G. A. D. A.]

"Cornwall" and "Patriot."

It is quite correct that on a recent occasion the famous 8 ft. 6-in. single-driver *Cornwall* piloted the 4-cylinder 4-6-0 *Patriot* on the 1.15 p.m. Scotch express from Euston as far as Crewe. The disparity in ages of the two engines was a modest one of 68 years. *Cornwall* is usually employed to haul the Chief Mechanical Engineer's special saloon, and had done so from Crewe to London on the day in question; it was returned to Crewe in the way indicated rather than working back light.

[Reply to T. WALNE.]

"Train Following" Boards.

We are informed by Mr. W. Marriott, engineer and traffic manager, Midland and Great Northern Joint Railway, that an oval disc bearing the letter "P" carried on the rear of the last vehicle of a train denotes that a special passenger train, of which there has not been time to issue a printed notice, follows. For a special goods train following the letter "G" is used in the same way. The running of such special trains is, of course, also advised by telegraph or telephone.

[Reply to E. M. P.]

Wellington Bank, Great Western Railway.

Wellington bank proper has a gradient of 1 in 81–90 for 2¼ miles, with ½-mile at 1 in 126 through the tunnel and ½ at 1 in 103-220 just above Wellington Station. But the ascent really commences at the 161½ mile-post on the London side of Taunton and has a total length of 12½ miles; beyond Norton Fitzwarren 2 miles at 1 in 209-220, and two further at 1 in 165 lead to the steep section first mentioned.

[Reply to G. T. H.]

Train Describer's Cabin, Great Eastern Railway.

The cabin you have noticed alongside the down suburban line, near Bethnal Green, Great Eastern Railway, is used by an official, whose duty it is, while the "intensé" services are in operation, to inform the signalmen in Bethnal Green East Junction Box of the destinations and routes of trains towards Enfield, Palace Gates and Chingford.

[Reply to W. J. H. ALLEN.]

Train Control, Lancashire and Yorkshire Railway.

The large 12 in. figures on Lancashire and Yorkshire Railway goods brake vans are the numbers of the vehicles utilised in connection with the concentration and distribution as arranged by the Train Control office, while the combination of large and small numerals constitutes the Carriage and Wagon Department vehicle number for registration purposes.

[Reply to "LANKY."]

R.O.D. Locomotives.

We understand that a total of 441 R.O.D. 2-8-0 locomotives of Great Central Railway type were built, and these are now mainly distributed among the leading

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English and Scottish lines, though, as there has been a certain amount of re-allocation we cannot give exact figures. They are regarded as " on loan," and have not been taken into the recognised locomotive stocks of the companies concerned.

[Reply to " CROXTETH."]

The Portsmouth Line, London & South Western Railway.

Gradients on this route afford every reason why engines of the " 736 " 4–6–0 type should, rather than should not, perform successful work if they were tried between London and Portsmouth. At present, however, the timings of the Portsmouth trains do not necessitate the use of such powerful locomotives, and they are therefore more usefully employed elsewhere.

[Reply to H. T. CLARKE.]

No. 36, Great Western Railway.

No. 36 was the first 4–6–0 engine on this line, but was designed for goods traffic. Several others, 4–6–0 or 2–6–0, followed, including No. 2,601, but all of these have since been rebuilt to agree with the ordinary 2–6–0 goods class to which they gave rise. We believe all, with the possible exception of No. 36, are still running, but as 2–6–0 engines.

[Reply to C. E. T. J.]

Eight-Wheeled Tenders.

4-4-0 engine No. 76, Great North of Scotland Railway, is fitted experimentally with a tender designed to provide increased water capacity. The bogie replaces the leading axle of the tender to reduce constructional variations to a minimum, the other two axles being arranged as usual. Several small Great Central Railway 4-4-0 engines are on loan to the Great North of Scotland Railway.

[Reply to L. W.]

4-4-0 Locomotives, Great Central Railway.

These are divided into five principal classes: the Sacré engines with outside bearings; the Pollitt 4-4-0's, many of which are now superheated, numbered mostly in the 800's; the Robinson 4-4-0's, numbered in the early 1000's; the latter rebuilt with large boilers and superheaters; and the " Directors." We cannot afford space for further details.

[Reply to " CROXTETH."]

Brake Releases.

The chain passing below the footboard of carriages on certain railways is for releasing the brakes of vehicles placed in sidings or otherwise not coupled to an engine, and is provided for the convenience of shunters. The chain opens a valve to allow air to escape from the train pipe in the case of Westinghouse equipment.

[Reply to W. UPTON.]

Irish Locomotive Exchanges.

An exchange of 4-4-0 locomotives did take place between the Great Northern and Great Southern and Western Railways in 1910, but no results of the trials were made public. The passage in the article to which you refer should read: " 52¼ miles were covered in five seconds over the first hour from Dublin."

[Reply to T. A. CARSON.]

Locomotive Constructional Costs.

The difference in cost between constructing a 4-6-4 tank engine of the London, Brighton and South Coast " Charles C. Macrae " type and a 4-4-2 or 4-6-0 tender engine of approximately equal tractive power, is probably not very great; it might amount to a maximum of 10 per cent. in favour of the tank engine.

[Reply to E. S. D.]

" Ringed " Semaphores.

Signal arms having a ring towards their outer ends apply usually to lines of a secondary character. On the London and North Western Railway signals applying to " relief " or " slow " lines on four-track sections are thus differentiated. On other lines ringed arms (usually smaller) apply to sidings and the like.

[Reply to L. V. R.]

New Great Western Railway Locomotives.

So far we know of none of the new 4-6-0 four-cylinder locomotives being yet in service. Presumably they will be named on the same system as those already at work. You are correct in pointing out that 4-4-0 engine *City of Chester* is numbered 3713 though its old number was 3436 as stated.

[Reply to " LADY OF QUALITY."]

2-4-2 Tank Engines, London & North Western Railway.

Nominally, at any rate, many of the 5 ft. 6 in. 2–4–2 tank engines are rebuilds

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from the old "Precursor" class 2–4–0 tender engines, though to all intents and purposes we believe them to have been virtually new locomotives when placed in service as tank engines.

[Reply to H. A. WHITE.]

"938" Class, Caledonian Railway.

These engines are understood to have proved too heavy for the Highland line, hence their transfer to the Caledonian Railway. The present "Clan" class were designed after the "938" class, and, therefore, while about equally powerful, comply with the requirements in every respect.

[Reply to H. FORDE.]

Non-Stop Running, London & South Western Railway.

Some years ago special boat trains from Plymouth to London made their only stop at Templecombe, to change engines, but such running has never been adopted for regular trains. Salisbury is a much more convenient division station, and is also an important connecting centre.

[Reply to J. H. SUTCLIFF.]

Colours of Great Eastern Railway Locomotives.

We cannot say what colour will eventually be decided upon. The new Beardmore 4–6–0 engines are certainly finished off to some extent, but in general they agree with the present temporary scheme of painting in vogue for Stratford locomotives.

[Reply to W. J. H. ALLEN.]

Track Circuit Indicators.

The plates you have noted attached to signal posts indicate that the section is protected by track-circuit, and, therefore, it is not necessary for the fireman of a goods train stopped there to proceed to the signalbox to remind the signalman that he is holding the train.

[Reply to V. M. SELBY.]

Petrol Rail-Car, London & North Western Railway.

This was a trial machine, and we are not aware that it has ever been systematically employed on any particular duty. A Daimler car has been also tried on behalf of the makers, but the one you refer to is a different design.

[Reply to H. A. WHITE.]

New London & South Western Railway Locomotives.

We have seen the statement that 4–6–2 and 4–8–0 tank engines are on order for this line, but we are advised by Mr. Urie that no engines of the classes referred to are under construction.

[Reply to "K. W. S. S." and "HAMPTONIAN."]

London, Chatham & Dover Railway Rolling-Stock.

Before amalgamation the London, Chatham & Dover Railway possessed many bogie main-line coaches, but none were, as far as we can recollect, provided with vestibule connections. Passenger carriages were then varnished teak.

[Reply to G. D. M.]

The Race to Aberdeen.

The fastest time, the special "Exhibition Run" of the West Coast route, but with a very light load, was 8 hrs. 32 min. from Euston to Aberdeen, 8 min. less than in the case of the last East Coast racing run.

[Reply to Monsignor Provost W. F. BROWN.]

Glasgow and South Western Railway Locomotives.

Presumably you refer to Mr. P. Drummond's 4-4-0 engines fitted with the Drummond feed-water heater, which requires a small exhaust pipe to allow steam which may be given off by the heated water to escape.

[Reply to F. R. A.]

Birmingham and Bristol Stations, Great Western Railway.

The new Snow Hill station at Birmingham was described in the RAILWAY MAGAZINE, August, 1912, and Temple Meads, Bristol, in the number for October, 1900. Both issues are now out of print.

[Reply to "DERBYITE."]

London & South Western Railway Electric Services.

The numeral "8" at stations on the Kingston "roundabout" route is for the guidance of motormen of eight-coach electric trains, to show where they should pull up.

[Reply to W. J. H. ALLEN.]

Derby Station, Midland Railway.

Derby Station has one main platform adjoining the main offices, and two

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islands, making a total of five through platforms, of which the aggregate length of platform faces is 5,862 ft.

[Reply to W. CAVAN.]

The Great Central Railway and Scotland.

York is the most northerly point reached by Great Central trains, and this only in virtue of running powers from Mexborough, north of Sheffield. Scotland is reached by connections from York over the East Coast route.

[Reply to "G.C.R. ADMIRER."]

4-4-0 Engines, Great Northern Railway.

There are only three classes—the small-boilered "400" series, most of which, if not all, are now rebuilt with larger boilers; the Ivatt non-superheater 4-4-0's, and the superheated 51–65 series.

[Reply to D. W. ALLEN.]

London and North Western Railway 4-6-0 Engines at Swansea.

Engines to which you refer are all of the 5 ft. mixed traffic type—a small-wheeled version of the express passenger "Experiments"—of which the London and North Western Railway has 170 in all.

[Reply to E. S. JONES.]

Heating of Pullman Cars.

In many cases each car has its own water-heating plant, but steam connections with the engine can be secured if they are coupled with ordinary carriages correspondingly adapted.

[Reply to C. THOMPSON.]

Connecting Lines at Canterbury.

We have no further information beyond the fact that there is now a connecting line between the two sections of the South Eastern and Chatham Railway at Canterbury.

[Reply to T. A. STROUD.]

London, Brighton & South Coast Railway Locomotives.

Your query is answered by a Pertinent Paragraph entitled "Some Locomotive Misunderstandings," published in the September RAILWAY MAGAZINE.

[Reply to W. CAVAN.]

The "Claughtons" in North Wales.

Engines of this type take their turns in the train workings of the Chester and Holyhead section of the L. & N.W.R. The engines to which you refer would have hauled the train from Holyhead.

[Reply to "MANCUNIAN."]

Bradshaw's Map.

Dotted lines you mention refer to the Cranbrook and Tenterden Railway and the old East Sussex line, powers of which have both elapsed, except as far as actually constructed.

[Reply to "SPEARMINT."]

Midland Engines in Swansea District.

In the ordinary course all Midland passenger traffic in this area is worked by 0-4-4 tank engines. As a resident in the district you are in a position to note any change in this practice.

[Reply to E. S. JONES.]

Restaurant Cars, London & South Western Railway.

Restaurant cars on the Bournemouth services run to and from Bournemouth West station.

[Reply to P. H. S. DREW.]

Folkestone Harbour Branch, South Eastern & Chatham Railway.

The gradient is 1 in 33 between Folkestone Harbour and the sidings at Folkestone Junction.

[Reply to T. A. STROUD.]

Bristol-Gloucester Trains, Great Western Railway.

Certain of these trains travel *via* Yate and over the Midland Railway to Stonehouse.

[Reply to C. E. T. J.]

Large-Boilered 4-4-0's, South Eastern & Chatham Railway.

Ten of these engines are of German and 12 of British build. We do not answer queries of the type of your first.

[Reply to "SUPERHEATER."]

0-10-0 Locomotive No. 2290, Midland Railway.

Full dimensions of this engine were given in the RAILWAY MAGAZINE, April, 1920.

[Reply to "BUFFER-BEAM."]

Axle-Loads.

Heaviest loads carried on any single axle on the Great Western Railway is 20 tons and on the Midland 19¾ tons.

[Reply to G. T. H.]

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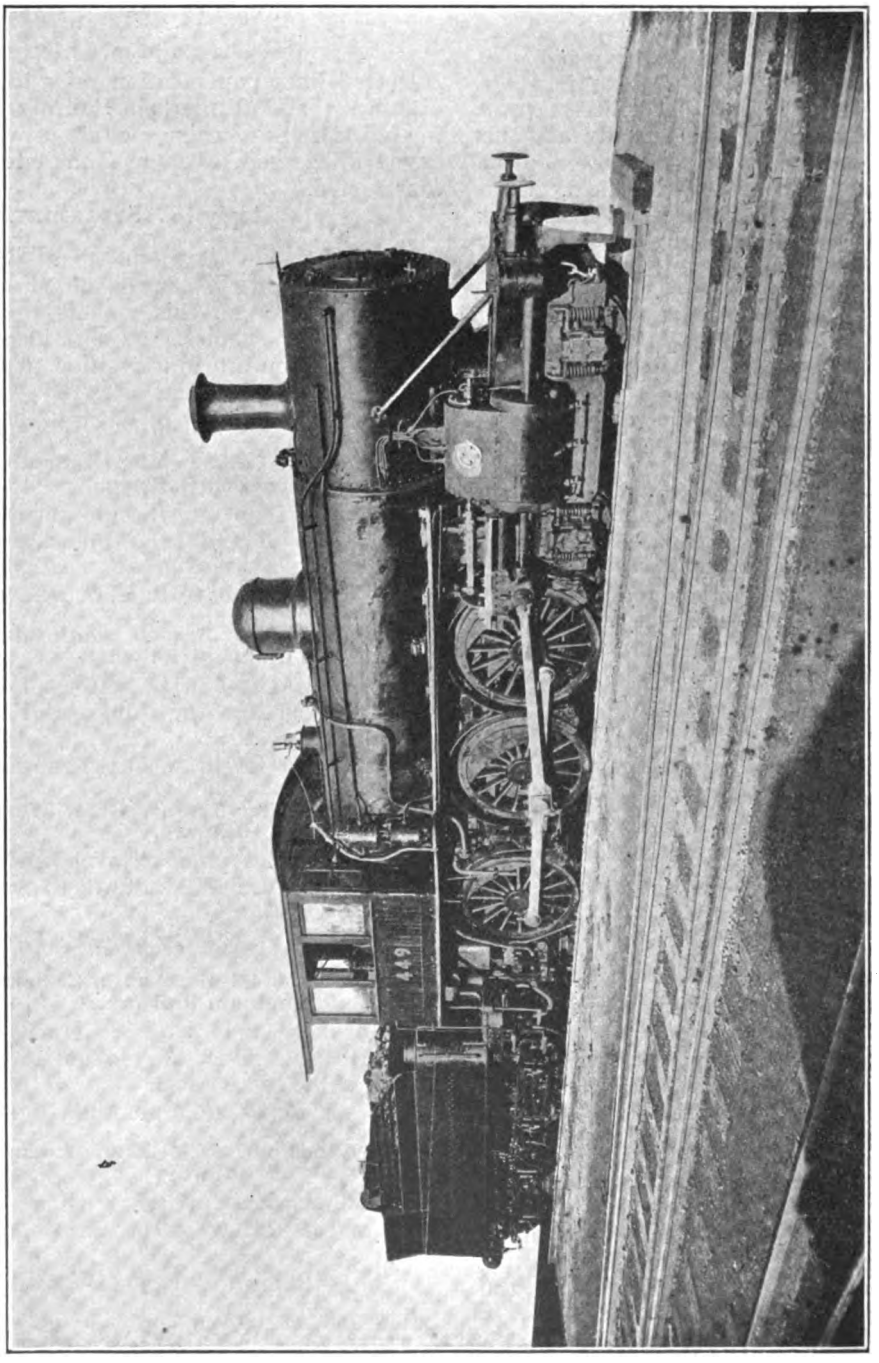
REBUILT 4-6-0 LOCOMOTIVE, NEW SOUTH WALES GOVERNMENT RAILWAYS.



Older locomotives as they come into the Eveleigh workshops of the New South Wales Government Railways for extensive overhaul are being fitted by Mr. E. E. Lucy, Chief Mechanical Engineer, with new boilers equipped with the "Eveleigh" superheater, new piston valve cylinders and, when required, new bogies having outside journals and axle boxes. The engine illustrated is a 4-6-0 of Class "O" thus treated.

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PERTINENT PARAGRAPHS

0-6-2 Tank Engine: Taff Vale Railway.

Our frontispiece illustrates an 0-6-2 tank engine recently placed in service on the Taff Vale Railway, built by Messrs. Nasmyth, Wilson & Co., Limited, of Patricroft, Manchester, to the design of Mr. J. Cameron, Locomotive Superintendent.

This type of locomotive has several advantages where traffic of the kind met with on the Taff Vale Railway has to be provided for. It embodies a short rigid wheelbase, thus facilitating the work of traversing sharp curves at dock and colliery sidings, whilst the presence of six coupled wheels permits of the distribution of the weight of the engine favourably for adhesion. At the same time the total wheelbase is kept within moderate limits by the adoption of a single radial axle below the cab, this at the same time increasing the flexibility of the wheelbase without materially adding to its length. An unusual feature is the comparative smallness of the grate area, this being kept as small as possible, consistent with handling the loads on the upward journey. In the case of the down loaded trains where the gradients are in favour of the load, as on this railway, falling from the collieries to the shipping ports, the engines have to do a great deal of coasting and shunting, and a small grate area tends towards a low consumption of coal per trip.

Coal traffic on the Taff Vale Railway is of a very heavy description, and the gradients at colliery sidings vary from 1 in 30 to almost level. On the main line between Cardiff and Pontypridd the ruling gradient is about 1 in 194, and the maximum speed for passenger trains ranges from 40 to 45 miles per hour. The loading for mineral trains is 50 to 55 empty wagons, which are hauled at speeds of from 17 to 20 miles per hour, whilst on the branch between Pontypridd and Treherbert the gradients change frequently and vary from 1 in 100 to 1 in 256. Loads dealt with on this section are the same as those on the main line, but the speed attained is less owing to the steeper gradients encountered.

Cylinders are inclined, and steam is distributed by balanced flat valves working above them. Valve gearing is of the Stephenson link motion type with rocking levers. Circular crank webs are used. The firebox is of the Belpaire type, steam pressure of 160 lb. per sq. in. Heating surfaces are:—Firebox, 108 sq. ft.; tubes, 1,211 sq. ft.; total 1,319 sq. ft. Grate area is 18 sq. ft. Other main particulars are as follows:—Cylinders, diameter, 18½ by 26 in.; coupled wheels, diameter, 5 ft. 3 in.; radial wheels, diameter, 3 ft. 8¾ in.; wheelbase, rigid, 14 ft. 6 in.; wheelbase, total, 20 ft. 7 in.

Capacity of the side tanks is 1,460 gallons of water and of the hind tank 200 gallons, making a total of 1,660. Fuel capacity of the bunker is 100 cu. ft. In working order the engine weighs 69 tons 1 cwt., of which 56 tons 11 cwt. 2 qr. rank for adhesion. The engine is equipped with automatic vacuum and handbrakes, also gravity sanding gear for both forward and backward running, train heating fittings, &c. The four windows in the cab front are shaped to give the maximum outlook, and all are hinged for opening.

Locomotive and Train Working, North British Railway.

From Buenos Ayres, as a former North British Railwayman, Mr. J. Lamb writes concerning several old North British Railway engines, and the following quotations, together with Mr. Ahron's remarks thereon, will be of interest in connection with our recently concluded articles on "Locomotive and Train Working in the Latter Part of the Nineteenth Century," in regard to the North British Railway:—

"No. 40A, a small 2-4-0 tender engine, very similar in appearance to the old 91 class but with smaller coupled wheels, at one time worked the Leadburn and Dolphinton branch

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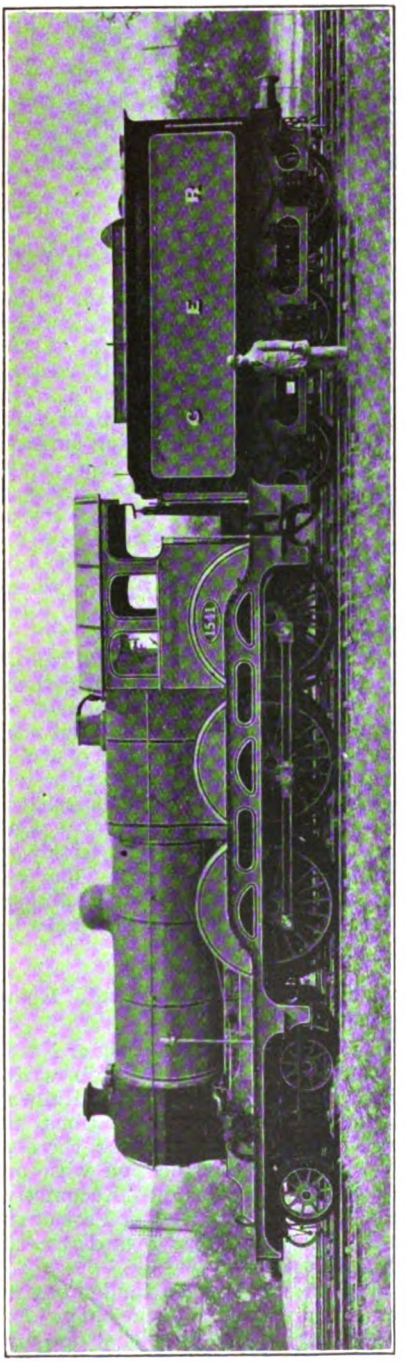
passenger trains, thence taking up the working of old No. 227A, mentioned by Mr. Ahrons, on the South Leith branch, where both engines ended their days. [This engine was built as No. 40 at Cowlairs in 1873, but included scrap parts from older engines. Coupled wheels were 5 ft. diam. and cylinders, 16 in. by 22 in.]



4-6-0 SUPERHEATER LOCOMOTIVE, GREAT EASTERN RAILWAY.
Built by William Beardmore & Co.

Mr. Lamb also inquires concerning Nos. 394A and 395A 0-4-0 tender engines. "No. 394A was working round about the Airdrie district and No. 395A, when last I saw her, was renumbered 1013 and working at Lochend Junction, Edinburgh." [Nos. 394 and 395 were four-wheeled mineral engines for service on branch lines with sharp curves. Built by Neilson & Co. in 1866. Wheels 5 ft. diam., cylinders (inside), 16 in. by 22 in.]

"Also No. 146, a small 0-6-0 saddle tank. When I knew her first she was working the Edinburgh and Leith passenger trains (over 30 years ago), and the last I saw of her was about the year 1898 or 1899, when she was stationed at Ladybank Junction. There was one thing about her, for those days, she gloried in having a cab. She must have been put on the duplicate list because a new 0-4-0 dock engine took her number." [No. 146 was one of six small saddle-tank shunting engines built at Cowlairs in 1874. Coupled wheels, 3 ft. 6in. diam. Cylinders, 13 in. by 18 in. (inside)].

Inquiry is also made as to the valve gear fitted to Mr. Drummond's 0-6-0 goods engine No. 153 in the years 1894–6, to which Mr. Ahrons replies that this engine had at one time Morton's valve gear. In concluding his letter Mr. Lamb mentions that in the race to Aberdeen in 1895 North British Railway engines used for the concluding East Coast runs were: No. 293, Driver Macgregor, Edinburgh to Dundee, and No. 262, Driver Spalding, Dundee to Aberdeen.

An Unprecedented Railway Advertisement.

RAILWAY history includes many strange happenings, but we doubt whether there has ever been anything to compare with the advertisements inserted by the Great Northern Railway of Ireland recently, due to the political troubles in Ireland. We are indebted to a reader from Cootehill for a specimen, a part of which may be [reproduced :—

IMPORTANT NOTICE.

Owing to the refusal of certain members of the Company's Staff to carry out their duties, a state of affairs has arisen which necessitates the closing of portions of the line for public traffic.

In addition to the Bundoran Branch the following sections of the Line will be Closed for Passenger, Goods, and Live Stock Traffic ON AND FROM MONDAY, 20th SEPTEMBER, 1920 :—

Dundalk to Enniskillen ;
Carrickmacross Branch ;
Cootehill Branch.

(Then follows a list of trains discontinued.)

For full particulars see posters at stations.

JOHN BAGWELL,
General Manager.

Dublin, 15th September, 1920.

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Labour Saving Appliances in Railway Service.

SEVERAL leading railways now invite suggestions for improvements in machinery and methods, and offer prizes for the best as incentives. In some instances, the suggestion scheme applies to the whole system; in others the matter is conducted departmentally. As an example, the Permanent Way Department of the London and North Western Railway recently offered rewards for suggestions pertinent to the work of the section, with the result that several distinctly clever proposals were elicited, some of which have been awarded prizes of substantial value.

We are indebted to the *London and North Western Railway Gazette* for the following statement giving particulars of a few of the principal suggestions and the rewards which the directors of the railway company have given to the men in appreciation of their work:—

(1) In connection with electric railways, the conductor rails are subject to "creeping" which arises both from the vibration of passing trains and the rubbing of the collector shoes. This is overcome by the use of an "Anchor Clip" designed by Chief Permanent-Way Inspector Scott, of the London Division. Awarded £60.

(2) Owing to the height of the cab of the larger types of engines, drivers are liable to injury to the head when running near loading gauges, which to a great extent is minimised or avoided by a type of gauge having hinged ends of some flexible material, such as cork linoleum; designed by Shop Foreman Billing, Watford. Awarded £5.

(3) A recommendation that the length of all point switches be made a multiple of 2 ft. 6 in. to accord with the spacing of the sleepers—made by Ganger Shaliker, Edge Hill. Awarded £5.

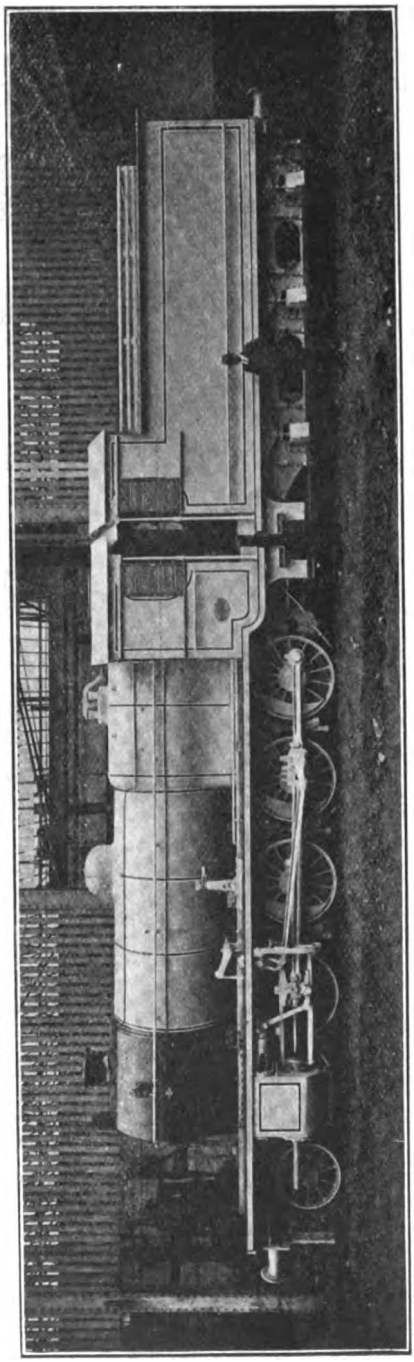
(4) For easy conveyance of conductor rails on electric lines for short distances a small trolley was designed and made by A. C. Kirk, fitter, Watford, which can readily be moved out of the way of trains. Awarded £5.

(5) A contrivance for lifting and carrying out old rails, and laying in new rails, during relaying operations, invented by Permanent-Way Inspector Duttin, Western Division. Awarded £100.

(6) A contrivance for picking up and "stringing out" rails during relaying operations, called a "pick-up and scooter"; after the rails have been unloaded from the rail train, invented by Ben Twist, underman in one of the extra gangs on the Western Division. Awarded £100.

Clever Devices for Assisting Permanent-Way Men.

Some of these proposals are distinctly good and worthy of wider adoption. The "rail pick-up and scooter" consists of a



2-8-0 SUPERHEATER LOCOMOTIVE, EAST INDIAN RAILWAY.
Built by William Beardmore & Co.

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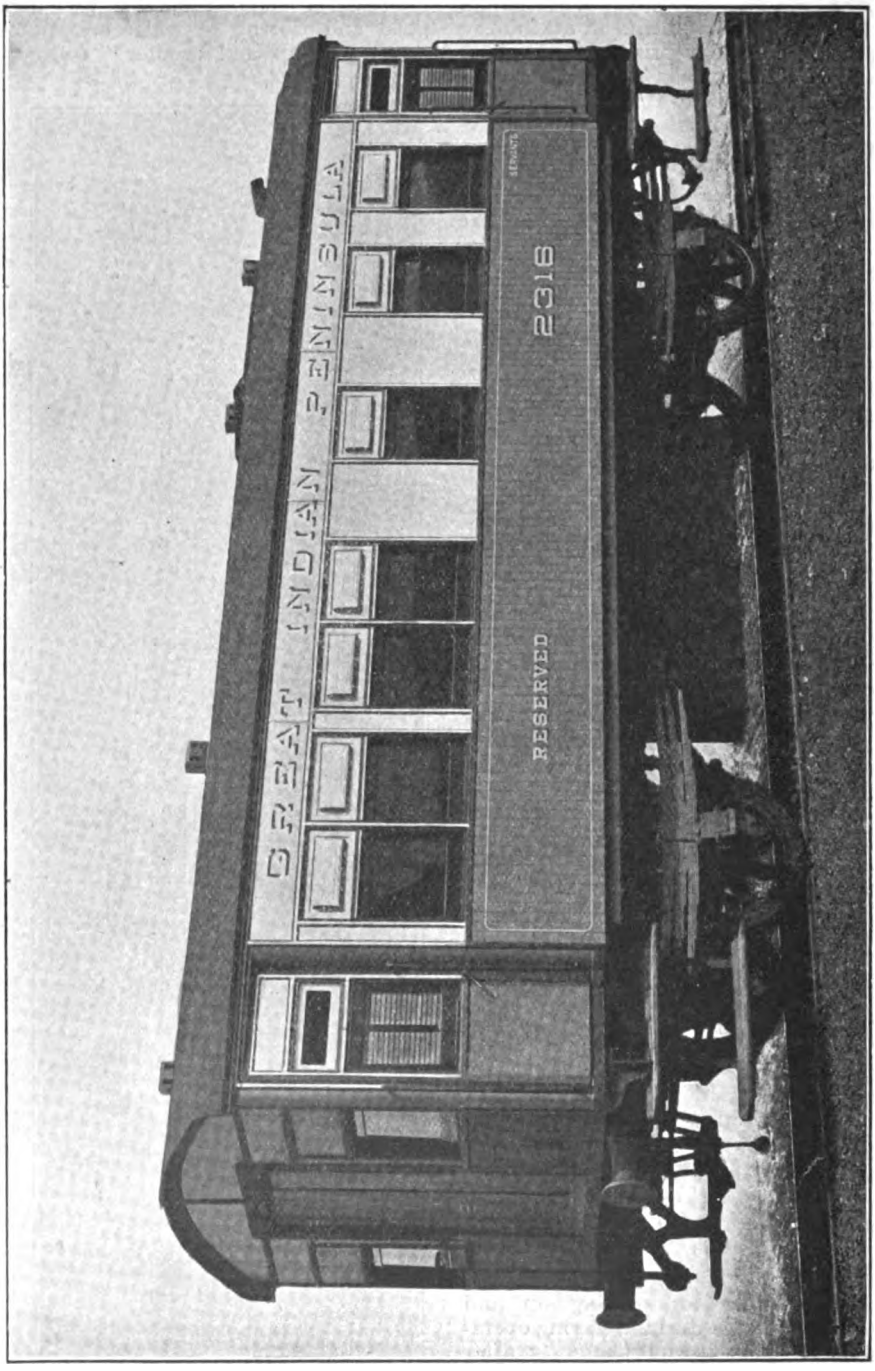

STAFF INSPECTION SALOON, GREAT INDIAN PENINSULA RAILWAY

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frame and lever arrangement constructed of metal with wheels attached, and takes the form of a lever and fulcrum combined to move on the rails of the permanent way. There is a rail clip suitably attached to the lever bar for holding up a rail and carrying, conveying, or transporting it. After rails have been discharged at the site where relaying has to be done, a pair of the appliances is used for picking up and moving singly any number of rails along the railway from one place to another in connection with maintenance, relaying, renewal and repair of railway lines. Four to eight men only are required to one pair of the appliances which will deal with rails up to the standard length of 60 ft. The weight of one of these appliances complete is approximately 1¼ cwt., and two men can easily and promptly remove it (together or in two sections) clear of passing trains as and when required. One appliance also provides easy means for two men to transport any heavy tool, &c., such as a jim crow, which is capable of being suspended to the lever bar.

The "Rail Remover and Layer" consists of a light portable gantry constructed of wood, the top of the beam being fitted with an iron runner on which a pair of grooved wheels or rollers move freely along. The pair of wheels are linked together with side brackets which extend a little below the beam, where a lever bar is suspended with a swivel arrangement at the bottom of the brackets, the swivel acting as the fulcrum to the lever. A rail clip is attached at the end of this lever for picking up the rails. When relaying operations are in hand, and the fish-plates to the old rails have been taken off, a pair of these appliances is used for picking up and removing the old rails aside as required. Six or eight men only are required for this part of the work, and by this means more men are available for throwing out the old sleepers and expediting operations generally. After the new sleepers have been laid in position ready for tipping in the new rails, a pair of the appliances are again used for picking up the new rails and carrying them into their place in the new road. The use of a pair of these appliances not only facilitates the work of handling the rails in relaying operations, but reduces any risk of men overstraining themselves or getting their fingers pinched through the ordinary method of lifting rails entirely by hand, as it is not necessary with these appliances for men to take hold of the rails with their hands. The weight of one of these appliances is approximately 2 cwt., and three or four men can easily and promptly remove it clear of passing trains as and when required.

A competition which produces eminently practical suggestions of this character fully justifies itself, and we are pleased to note that the staff are again invited to submit suggestions to the Chief Engineer.

Staff Inspection Saloons, Great Indian Peninsula Railway.

IT is essential for officers engaged on open line working in India to be provided with a carriage in which they can live whilst inspecting out-stations, and it is the custom to provide all district officers with such private saloons. The saloon shown is one of several recently built at the Matunga carriage shops of the Great Indian Peninsula Railway from the designs of the Carriage Superintendent, Mr. A. M. Bell, and represents a very comfortable and useful carriage. The length of the body is 29 ft. 4 in. and its overall width outside is 10 ft. The internal arrangements are clearly shown in the plan; there is a living room with two berths, office table, &c., a bath room, compartment for servants and a kitchen. The framing of the body of the car is of teak with steel upper panels and teak sheeting below. Between the inner and outer lining "uacolite" sheeting is introduced to insulate the interior. The bearing springs are specially to be noted—each one being built of three independent sections of five plates; it is claimed for this construction that a very steady riding vehicle is secured. Electric lights and fans and Monarch ventilators are fitted. These cars can be vestibuled together when an inspection train is required, so that all the officers travelling in the train can mess together in the attached restaurant car.

A Study of Locomotive Types.

IN the June RAILWAY MAGAZINE Mr. Allen reviewed the numbers of engines of each principal wheel-type on the leading railways, and Mr. J. C. Seads, of Minehead, Somerset, has gone to a great deal of trouble by working out the percentage of each, in the case of railways owning 500 or more locomotives. Space cannot be given to reproduce his tables in full, but the following remarks will be of interest:—

"Of the tender engine types the 0-6-0 reaches a very high figure, particularly is this so on the northern lines; the North British Railway having no less than 70·8 per cent. of this type, and the Midland 66·8 per cent., the smallest percentage being that of the London and South Western Railway, which has only 15·1 per cent., but this company has the biggest percentage of 4-4-0's—58·9. The maximum percentage of 4-6-0's is 22·7 on the London and North Western, and of 4-4-2's 13·0 on the Great Northern; 2-4-0's

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are nowhere very numerous, but the Great Eastern Railway has 13·7 per cent., while 0-4-2's work out at 17·2 per cent. on the London and South Western Railway, and 4-2-2's 4·1 per cent. on the Midland. Of goods and mixed traffic types 2-6-0's reach the highest figure on the Great Western Railway, 18·8 per cent., 2-8-0's on the Great Central, 16·0 per cent. and 0-8-0's 29·0 per cent. on the Lancashire and Yorkshire.

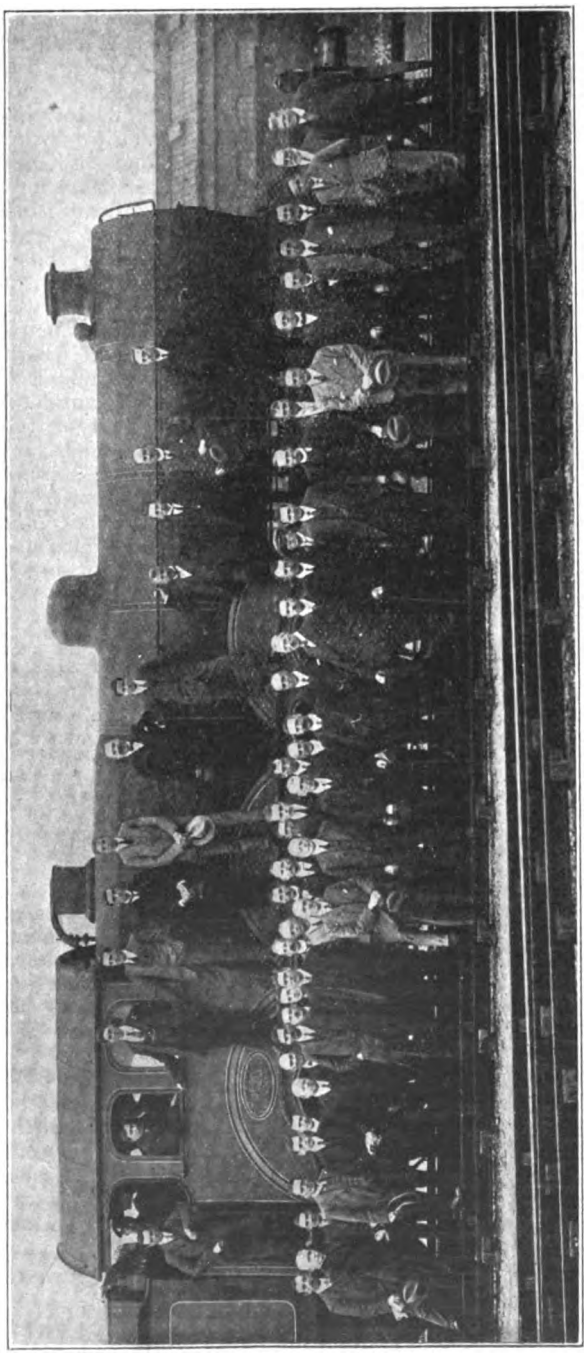

Photo.] INSTITUTION OF LOCOMOTIVE ENGINEERS—VISIT TO STRATFORD WORKS, GREAT EASTERN RAILWAY, SEPTEMBER 23, 1920. [F. Moore.

Tank engine types are more numerous, but mention may be made of several noteworthy figures. On the South Eastern and Chatham Railway the 0-4-4 type is responsible for 79·5 per cent. of the tank engine stock, while 0-6-0's are highest on the Great Western, 63·9 per cent.; 2-4-2's on the Lancashire and Yorkshire, 47·4 per cent.; 0-6-2's on the Great Central, 44·0 per cent; 4-4-2's on the London and South Western, 20·7 per cent.; 0-4-2's on the London, Brighton and South Coast, 25·7 per cent.; 0-4-0's on the Glasgow and South Western, 14·1 per cent.; 4-4-0's on the North British, 10·4 per cent.; 2-6-2's on the Great Western, 9·7 per cent.; and 0-8-2's on the Great Northern, 8·8 per cent.

Institution of Locomotive Engineers.

On Thursday, September 23, the Institution of Locomotive Engineers opened its 1920–21 session. In the afternoon, at the invitation of Mr. A. J. Hill, C.B.E., Chief Mechanical Engineer, Great Eastern Railway, the members of the Institution paid a visit to Stratford Works and were afterwards entertained at tea in Mr. Hill's office. The arrangements made were admirable, the members being divided up into small parties of not exceeding half-a-dozen, in charge of competent guides, who took different routes through the works; the various parties meeting finally in the new repair-shop for out-station work. This fine shop was used during the war for Government work. It was built for the purpose of dealing with out-station repairs which hitherto have been carried on at Ipswich, Norwich and Cambridge. The proceedings terminated with a cordial vote of thanks proposed by Mr.

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Pickersgill to Mr. Hill and his staff for a very instructive afternoon. The members then made their way to Westminster to hear the Presidential address at Caxton Hall.

Mr. A. J. Hill, C.B.E., Chief Mechanical Engineer, Great Eastern Railway, Past-President, occupied the chair. After the formal business had been concluded the Chairman introduced the President, Mr. W. Pickersgill, C.B.E., Locomotive Superintendent, Caledonian Railway, who was supported on the platform by Mr. R. H. Whitelegg, Chief Mechanical Engineer, Glasgow and South Western Railway; Mr. H. Kelway-Bamber, M.V.O.; Mr. J. Clayton, personal assistant to the Chief Mechanical Engineer, South Eastern and Chatham Railway, Mr. W. A. Lelean; Mr. F. Attock, Lancashire and Yorkshire Railway; and Sir Seymour Tritton, K.B.E.; with the General Secretary, Mr. G. F. Burtt.

On the conclusion of the Presidential address, Mr. A. D. Jones, South Eastern and Chatham Railway, Past-President, proposed a vote of thanks to the President, which was seconded and carried.

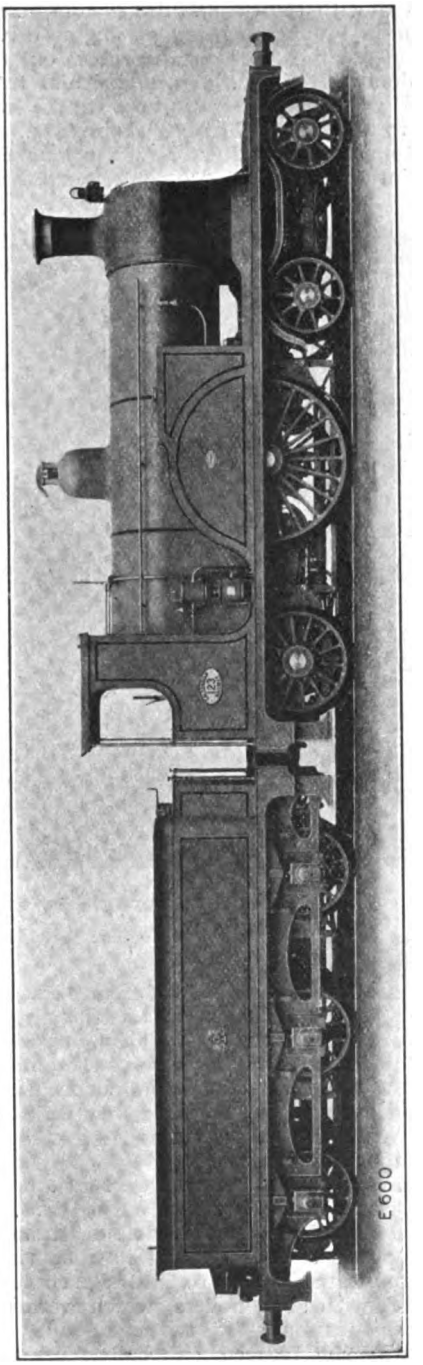
Locomotive Development on the Caledonian Railway.

In the course of his address Mr. Pickersgill gave an interesting review of locomotive development on the Caledonian Railway, the main features of which will be of general interest:—

"On the Caledonian Railway we have had at least seven decades in the evolution of the locomotive between 1847 and 1917. The original locomotive stock consisted almost entirely of outside cylinder engines, but passenger engines were the same design as the outside cylinder engines first built by Mr. Alexander Allan, of Crewe. Mr. Allan went to Perth in 1853, where he took charge both of the general management and the locomotive department of the Scottish Central Railway. He left the service of this company at the end of 1865 on its amalgamation with the Caledonian Company. Mr. Allan was the inventor of the straight link motion, and it is interesting to note that about 1860 he constructed several locomotives with steel fireboxes. Mr. Robert Sinclair was Locomotive Superintendent from 1846 to 1856, and introduced the 7-ft. single engine.

"Mr. Benjamin Conner built in 1859 passenger engines for the Caledonian Railway, with 8-ft. driving wheels, and these engines for many years worked the bulk of the main line traffic between Glasgow and Carlisle. An engine of this type was built from Mr. Conner's drawings by Neilson & Co., of Glasgow, and was exhibited by that firm at the London International Exhibition of 1862, and was purchased by the Egyptian Government, His Highness the Pasha of Egypt requiring an engine to take him at a speed of 70 miles an hour.

"On the death of Mr. Connor in 1876, Mr. George Brittain was appointed Locomotive Superintendent, and during his tenure of



4-2-2 LOCOMOTIVE, No. 123, CALEDONIAN RAILWAY. EXHIBITED AT THE EDINBURGH INTERNATIONAL EXHIBITION, 1886.

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office he produced the bogie engine with 5-ft. wheel and 18-in. cylinders. It was during Mr. Brittain's term of office that the first engine was built that was fitted with the Westinghouse air brake, and the Caledonian Railway Company made some important trials with this brake. They also experimented with the Steel-McInnes compressed air brake—McInnes being an engine driver and ultimately Brake Inspector on the Caledonian Railway. An engine and train fitted with the Steel-McInnes brake was sent to the Newark brake trials in 1875.

"Immediately after Mr. Drummond's appointment express locomotives were built that date being built of iron. These boilers were constructed to work 200 lb. pressure per sq. in., but in actual practice a lower pressure was adopted. One of these engines, *Carbrook*, was shown at the Edinburgh Exhibition of 1890.

"Mr. John F. McIntosh was appointed Locomotive Superintendent in 1895, and his name will be well known in the railway world on account of his introducing boilers of larger capacity with increased grate area and heating surface, as he considered that the power of the locomotive depended to a great extent on the capacity of the boiler. His first passenger engines, the famous

DEMONSTRATION OF REGAN TRAIN CONTROL SYSTEM.

Inspecting Fittings on Engine: Mr. J. B. Regan (left), Mr. J. H. Thomas, M.P. (centre).

of much heavier weight and of greater tractive power to meet the needs of the traffic. At this time most of the locomotives on the Caledonian Railway were of the outside cylinder type, but Mr. Drummond altered the design, and in 1884 the first series of inside cylinder 4-4-0 express engines made their appearance.

"It is interesting to know that during Mr. Drummond's tenure of office the locomotive power of the Caledonian Railway developed considerably, and in 1889 there were built at St. Rollox to his design six locomotives with steel boilers, which were the first engines built by the company with boilers of this material, all boilers prior to "Dunalastair" class, came out in 1896, and this class was followed by enlarged editions of the somewhat similar engines of 1898 and 1900. During these decades the tractive power of the locomotives increased from 4,780 lb. to 22,666 lb."

The Regan Train Control System.

FOR many years past inventors have been endeavouring to produce an automatic train control system designed to secure safe operation under all conditions of train working, and a number have been tried on British railways. Such apparatus has, indeed, been regularly installed on parts of the Great Western and North Eastern Railways,

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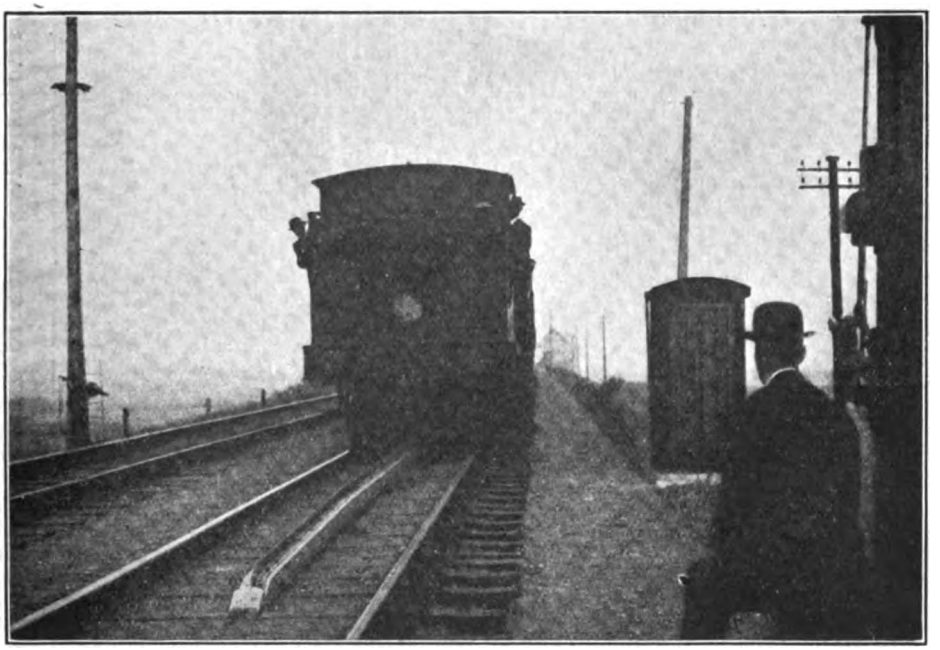
while the "SYX." electro-mechanical train stop is used to some extent on the Great Eastern Railway. We may also mention the "Railophone" inductive and the Prentice "wireless" systems described in these pages some years ago.

In pursuance of the policy of giving every appliance likely to secure safety in railway operation an opportunity for showing its practicability, the Great Eastern Railway recently equipped a section of line for trial and demonstration of the Regan train control system, which has already given good results on the Chicago, Rock Island and Pacific Railway in the United States. We were recently privileged to attend a demonstration of the Regan apparatus in company with a large gathering of chief officers of the Great Eastern Railway and signal engineers of several other railways, together with signalling experts and representatives of the technical and general press. The Right Hon. Mr. J. H. Thomas, M.P., travelled on the engine during the tests.

At Fairlop Station, on the Woodford and Ilford loop line, the down home signal and the "distant" thereto on the London side of Hainault Station (closed) had been equipped with ramps between the rails, the section being track-circuited through to the advanced starting signal. The trial train loaded to about 250 tons, was worked by rebuilt 2-4-2 tank engine No. 96, to which the necessary equipment had been fitted. Incidentally the trials were made within ten days of the arrival of the parts from the United States and private tests had been carried out within a week.

A feature of the Regan system is that it includes speed control, and unless the speed for which it is set is exceeded the apparatus is inoperative where only speed reduction is called for. Thus it can be set to ensure speed reduction when approaching a sharp curve or where a rigid speed order is in force; by altering the speed adjustment on the engine the varying conditions of fast or slow, or passenger or goods trains can be met.

The first run, with all signals clear, gave unrestricted speed; the second, with all signals "on" entailed a reduction at the distant and a stop at the home. The third included the presence of an engine between distant and home, though all signals were clear, and resulted in an automatic stop at the distant. Other tests covered a fouled cross-over and points out of order, thus covering various conditions under which the apparatus might be called upon to justify itself in practice, operation being entirely automatic, and notwithstanding that in several instances the engine was steaming hard when pulled



DEMONSTRATION OF REGAN TRAIN CONTROL SYSTEM.

Passing over Home Signal Ramp during Trials.

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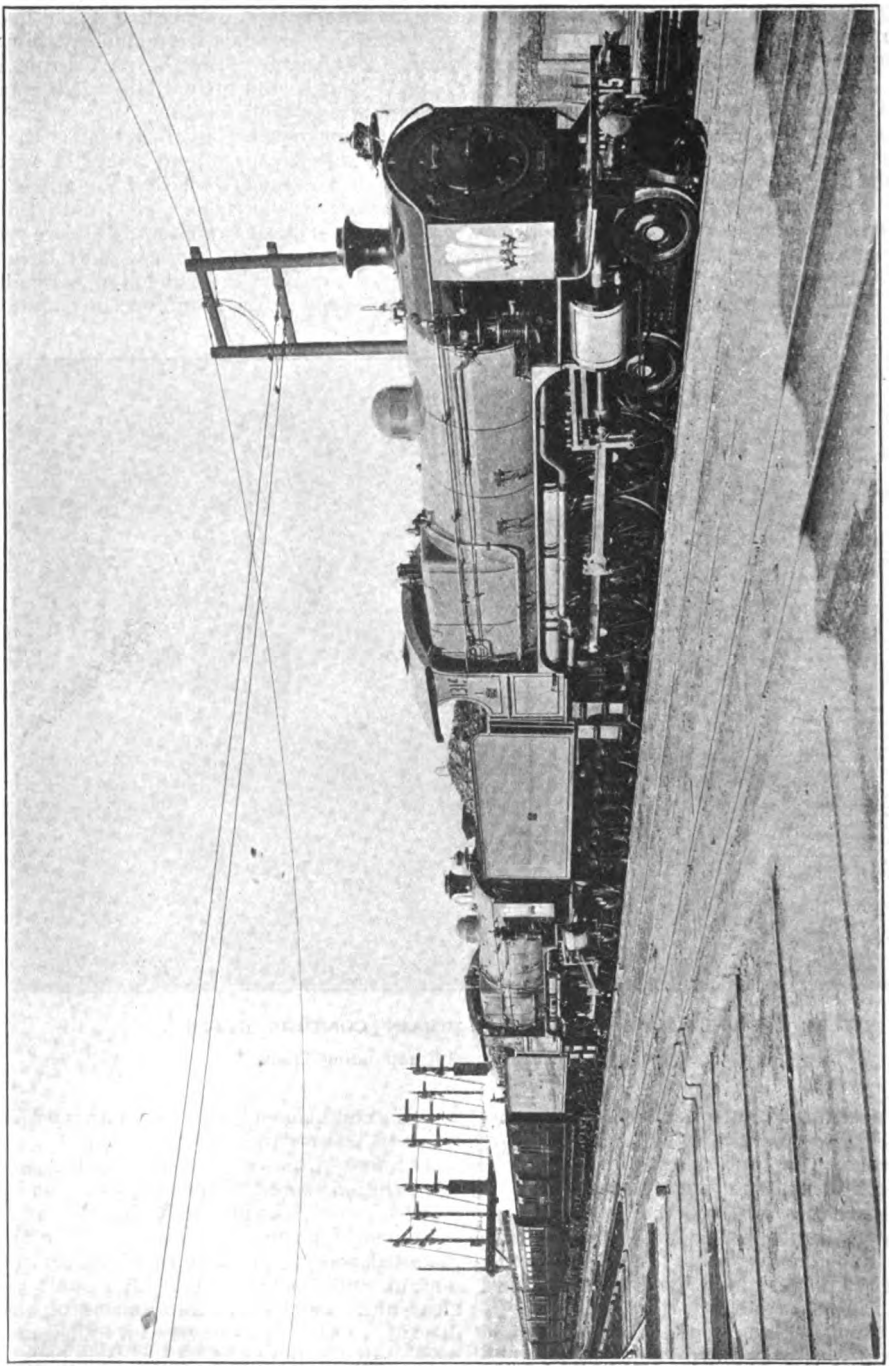

THE ROYAL TRAIN IN WHICH H.R.H. THE PRINCE OF WALES TRAVELLED OVER THE NEW SOUTH WALES GOVERNMENT RAILWAYS. (*See also page* 251, *October*, RAILWAY MAGAZINE.)

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up. As tested the engine was not fitted with warning or indicating gear, so that the driver had no part in the control.

Main Features of the Apparatus.

THE locomotive equipment is so arranged and interconnected as to cause the shoe stem to pick up an indication from the track apparatus of the proper characteristic to actuate a relay to one of three positions, namely, "full proceed," "caution" or "stop." As the shoe rides up the inclined surface of the ramp it moves the electric circuit controller to disconnect a storage battery, at the same time connecting the ramp circuit, which remains connected during the travel of the shoe over the horizontal surface of the ramp.

When a full proceed or caution indication is received the storage battery supplies energy to the locomotive equipment to maintain the indication so received until the characteristic of the current is changed to actuate the relay to the other position or to stop the train as the case may be, excepting that the storage battery is cut off from the circuit, and energy from the track apparatus is substituted at each signal or ramp location momentarily.

When the locomotive equipment is actuated to the full proceed position the storage battery supplies energy through a circuit controller directly connected to the stem of the shoe mechanism and to the magnet of an electro-pneumatic valve, thus actuating the valve so that it closes the brakepipe vent and opens the reservoir supply to the driver's brake valve. While in the full proceed position the speed circuit controller is cut out from the circuit entirely.

When the character of the current is changed by the track apparatus and the locomotive and tender equipment is actuated to the caution position the circuit is as above described, excepting that the speed circuit controller is automatically connected into the circuit. If a train exceeds the predetermined speed for which the speed circuit controller is adjusted it operates to de-energise the electro-pneumatic valve, thus opening the brake pipe vent and causing a service application of the brakes, at the same time closing the reservoir supply to prevent the brakes being released by the driver's brake valve. When the speed has been reduced to the point at which the controller is set it operates to close the electric circuit, thus again energising the magnet of the electro-pneumatic valve, closing the brake pipe vent and restoring the reservoir pressure to release the brakes.

Having received a caution indication the speed is automatically restricted throughout the caution block very closely to the predetermined point for which the controller is adjusted, the brakes applying automatically whenever the train exceeds the predetermined speed and releasing automatically whenever the speed is reduced to the proper point.

A stop indication is received whenever the shoe contacts with a ramp which is de-energised. Under such a condition the locomotive circuit is opened, thus operating the electro-pneumatic valve to cause an application of the brakes, at the same time closing off the reservoir supply to prevent release of the brakes at the driver's brake valve, as described for operation under a caution indication.

Locomotive Working on Scottish Railways.

WE are indebted to several Scottish readers for notes concerning the working of locomotives on various sections north of the Border, and as some of these possess wider interest the more important subject-matter may be briefly reviewed.

Mr. R. G. Michell, of Brora, Sutherlandshire, mentions that besides the two special 4-4-0 engines, Nos. 73, *Snaigow*, and 74, *Durn*, the following locomotives are regularly used north of Inverness on the mail trains. No. 63 *Ben Mheadhoin* (large "Ben" class), No. 146, *Skibo Castle* (4-6-0), No. 72, *Loch Ruthven*, and No. 121, *Loch Ericht*.

Mr. E. Le Q. Herbert, of Falkirk, sends a revised list of the new "Glen" class 4-4-0 engines on the North British Railway, as follows:—No. 34, *Glen Garvin*; 35, *Glen Gloy*; 490, *Glen Dessary*; 492, *Glen Gau*; 493, *Glen Luss*; 494, *Glen Loy*; 495, *Glen Mallie*; 502, *Glen Fintaig*; 503, *Glen Arklet*; 504, *Glen Aladale*; and 505, *Glen Cona*. Commenting upon the absence of 491 in this series of numbers Mr. Herbert points out that this number is borne by one of the new super-heated 0-6-0 goods engines. The new "Glens" are mainly at Edinburgh or Glasgow, though No. 502 *Glen Fintaig* has been working between Dundee and Aberdeen.

Mr. M. M. Niven writes that the Wemyss Bay section of the Caledonian Railway has this summer been worked by 4-6-2 superheater tank engines, No. 947 of this class having been stationed at Wemyss Bay, No. 946 and 948 at Ladyburn, Nos. 944 and 945 in Glasgow. No. 31, a superheater 0-6-0 engine, however, frequently ran the 9.30 a.m. Arran boat train from Glasgow, returning with the corresponding 4.50 p.m. up. Discussing various older engines Mr. Niven mentions that No. 1116 (originally 116, of the small Drummond bogies built in 1889) is now the Gourock passenger pilot engine, No. 721, *Dunalastair*, no longer has the name on the driving splashers, but in place has the usual coat of arms.

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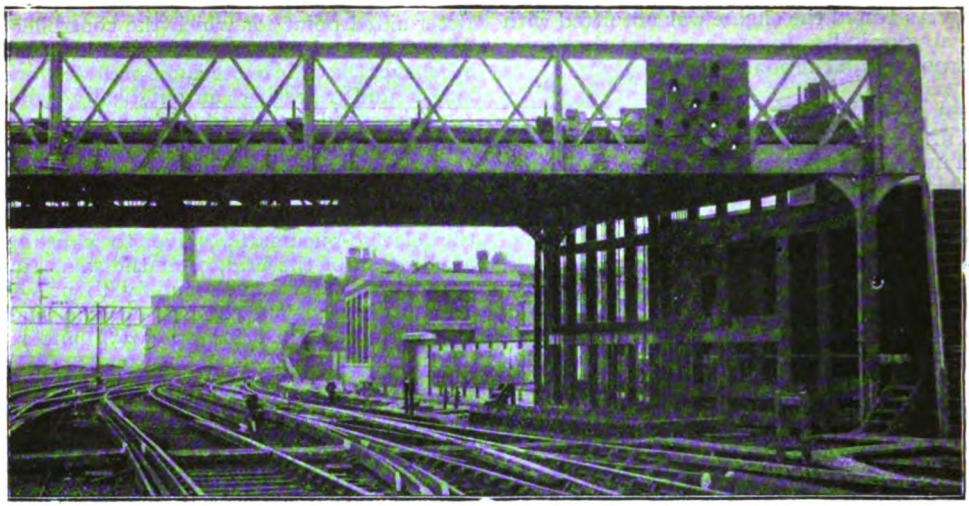


THREE-POSITION LIGHT SIGNAL AT WATERLOO LONDON & SOUTH WESTERN RAILWAY.

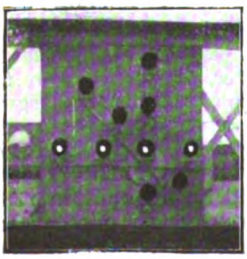
Position Light Signalling on the London & South Western Railway.

On several occasions reference has been made to the "position light" system of signalling, and an interesting installation has recently been fitted by Mr. W. J. Thorrowgood, Signal and Telegraph Superintendent, London and South Western Railway, on the girder of the Waterloo A Box, over the Windsor line facing No. 16 platform. Generally speaking, this consists of 10 electric lamps, suitably mounted on a black board. The electric lamps have a small filament placed in the focus of a dioptric lens made of white glass enclosed in a green-yellow tinted glass outer cover, which gives the lights a slightly yellow appearance. It is found that the rays emerging from this tinted coloured glass have a greater penetrating power than white light through fog. The dioptric lens concentrates the light in a fairly wide divergent beam, which can be easily seen at a distance of over 1,000 yards, even in bright sunshine. The lamps are so placed that the centre of the beams are directed towards the driver's line of sight.

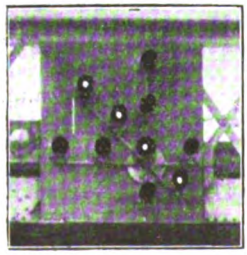
It is so arranged that only four of the 10 lamps are alight at the same time. The "stop" or "danger" indication is given by four lamps arranged horizontally. The "caution" or "be prepared to stop at the next signal as that signal is ON" indication is given by four lamps arranged diagonally. When four lights are arranged vertically it represents to the driver that the line is "clear and the next signal is in the proceed position."

Before seeing these lights it is difficult for an ordinary person to imagine that any lamp can be visible in brilliant sunshine, but these lights can be seen distinctly in bright sunshine at a distance of 1,000 yards, although the candle power of the electric lamps is comparatively small. During night time the quantity of the light has to be diminished by 50 per cent., or the light would be too intense, and appear dazzling to the drivers.

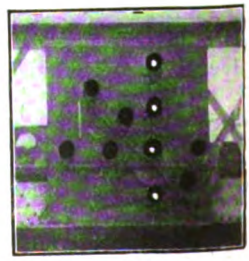
The chief advantages of this system lie in the fact that all colour lights are dispensed with; indications are the same night and day, and the lights can be seen much



Danger.



Caution.



Clear.

INDICATIONS OF THREE-POSITION LIGHT SIGNAL.

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better than a semaphore arm, or any coloured light, during foggy or snowy weather; and there is no moving mechanism, no wires exposed on the ground, and the expansion and contraction of the wire due to changes of temperature are altogether avoided.

The State and Railways.

In view of the special character of war period agreements between the State and the home railway companies, many of which include matters requiring settlement, the Minister of Transport has appointed a Departmental Committee on Railway Agreements to consider and report as to:—

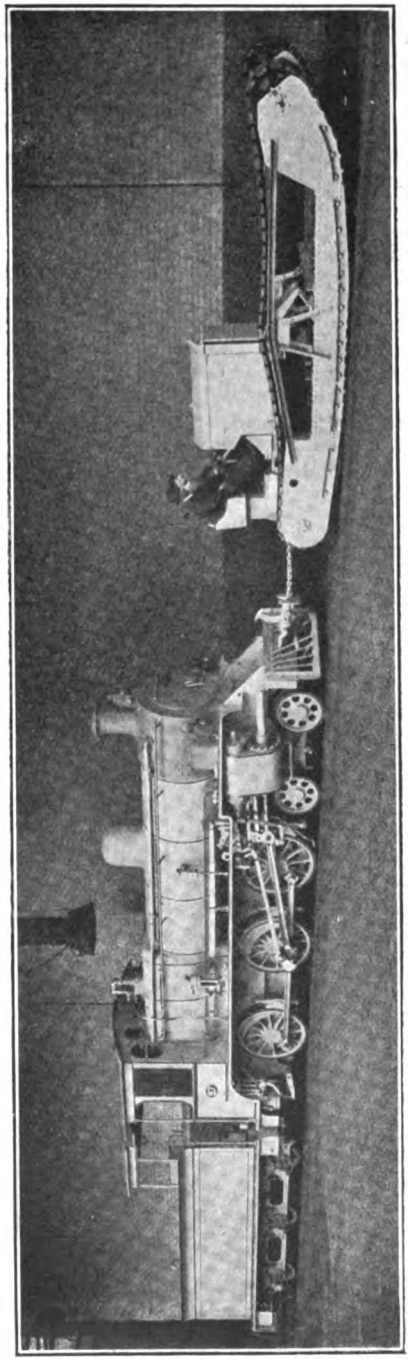
i. The nature and terms of the Agreements made between the Government and the Railway Companies relating to the possession by the Government of the undertakings of the Companies.
ii. The possible extent of the outstanding liabilities of the State thereunder, according to the interpretations which may be placed upon such Agreements.
iii. Whether, with due regard to cost, any further steps should be taken to secure that the interests of the State in reference to such Agreements are adequately safeguarded.

And generally to make such recommendations as appear desirable in the circumstances.

The Committee is composed as follows: Lord Colwyn (Chairman); Major H. Barnes, M.P.; Sir Godfrey Collins, K.B.E., C.M.G., M.P.; Mr. William Graham, M.P., L.L.B.; Sir Hardman Lever, Bt., K.C.B.; Sir Halford Mackinder, M.P.; Sir Thomas Robinson, M.P., and Mr. W. Peter Rylands. Mr. E. Twentyman, of the Ministry of Transport, will act as Secretary and all communications should be addressed to him at the Ministry of Transport, 6, Whitehall Gardens.

During the war the Government, in connection with the control of railways, made agreements on various points involving large financial obligations. A strong feeling was shown in the House of Commons that these commitments should be examined by an independent committee, and the Prime Minister informed Major Barnes, on August 5, that a Committee would be appointed, the above being the outcome.

The railways were taken over by the Government under the Regulation of the Forces Act, 1871, which provides for Government control only from week to week. This position of affairs, which inevitably led to arrangements of a temporary or emergency character, continued from August 4, 1914, to August 15, 1919, when the Ministry of Transport Act was passed. The Government guarantee applied for a period of two years after the war, but the Ministry of Transport Act shortened this period and the guarantee now terminates on August 15, 1921. Fifteen per cent. has already been added to the amounts paid to the companies in respect of maintenance work not carried



ARMY GUN TRACTOR USED FOR HAULING A "DEAD" LOCOMOTIVE AT MESSRS. NASMYTH WILSON & Co.'s WORKS.

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out, calculated at 1913 costs. These payments are merely on account of the ultimate cost of making good arrears at the increased prices which will obtain when the work of maintenance is actually carried out. It was further agreed that the payments in respect of these arrears should not take into account abnormal wear and tear due, during the period of control, to heavy munitions and military traffic.

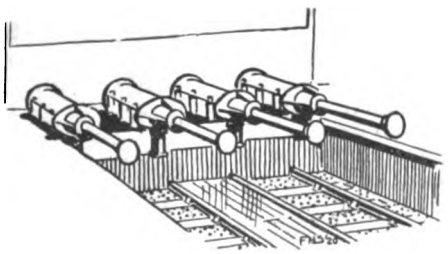
From the beginning of control, it was agreed in August, 1916, that payment should be made to the companies in respect of works and rolling-stock, &c., charged to capital and brought into use subsequent to December 31, 1912. Payments to be calculated at 4 per cent. per annum. This rate afterwards became 5 per cent., and was allowed on capital as spent. There was yet another agreement in August, 1916, that at the end of control payment should be made to each company equal to the difference between book value of stores in stock at the beginning of the war and the value of similar stores calculated at the prices ruling at the end of control.

"Any Complaints."

WHILE railway officers can by observation and investigation, realise the general requirements of passenger travel, it is not always practicable for them to appreciate the needs of individual passengers, and Sir Henry Thornton, K.B.E., General Manager, Great Eastern Railway, has adopted the novel course of issuing circulars, inviting comment and suggestion from travellers on the Chingford, Enfield and Palace Gates routes, which may provide useful data for future revision of the new services now operated on these routes, as described in our August number and referred to on another page of this issue.

The circular is couched in semi-humorous terms, for which reason it has probably received much closer attention than would have been the case were it in ordinary official and serious language, and the following extracts may be quoted: "It is impossible to completely satisfy all our passengers, for the requirements of some are in direct opposition to those of others . . . Passengers must know their own inconveniences better than anyone else. . . . The space on the back of this memorandum is divided into two portions, the upper for the passenger's name and address and requirement briefly stated, the lower for details, should these be necessary, which is most unlikely; and also for the benefit of those who cannot state a simple requirement without also giving an epitome of their past life and what they intend to do in the future, together with a violent attack on railway officials in general."

A specimen form, intentionally stated in extravagant terms, is supplied for illustration, the "space for elaboration" portion reading as follows: "I have been a tenant of certain of your arches for the past 40 years and a season ticket holder for quite 30 years, the last 10 of which I have held a first-class ticket. Previous to holding a season ticket I travelled third and your carriages were then a disgrace to any railway. They are now, if anything, considerably worse and unless you immediately arrange for more trains to call at both St. James' Street and Hackney Downs, I, together with my father, grandfather, &c., will, in future, cease to use your railway and either walk or buy bicycles. Your train services were evidently arranged by the office boy, and so forth, to about four pages of foolscap." To this is added the footnote: "The whole of these remarks are redundant and simply confuse the issue."



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MR. M. J. MAGUIRE, who has been appointed General Manager of the Dublin and South Eastern Railway, entered the service as a member of the clerical staff at Amiens Street Junction (Loop Line) in 1894, and within 18 months he was clerk in charge of the Parcels Department at that station, and after a little more than a year in that position he became clerk in charge of the Goods Department at Bray. In 1900, he was moved to the Traffic Manager's Office, Westland Row, where, beginning as a General Correspondence Clerk, he was there in succession Chief General Correspondence Clerk, Chief Claims Clerk, Chief Clerk of the Department concerned in the running of trains and compilation of time-tables, and all matters connected with the physical running of the service. In 1907 Mr. Maguire was placed in charge of the Rates and Fares Department, which included the compilation and distribution of the company's popular tourist guides. It was in this department he showed such exceptional initiative, that the popularity of the County of Wicklow, as one of the beauty spots in Ireland, became well known to the workers in the industrial towns of Lancashire and Yorkshire and many other districts in Great Britain. In 1916 Mr. Maguire became Audit Accountant. His handling of rates and fares questions had been so successful that the directors decided that the Rates and Fares Department should go with him to the Audit Office, and on his appointment in September of that year to the position of Chief Accountant, he still retained control, and this department he again takes with him in his new office. In the autumn of 1918 Mr. Burgess, the present Assistant General Manager of the London and North Western Railway, who was at that time Director of Cross-Channel Transportation and Coal Controller for Ireland, obtained the consent from the directors of the Dublin and South Eastern Railway to take Mr. Maguire as his personal assistant. In this position he assisted Mr. Burgess to tide over successfully the difficulties of the Irish cross-Channel shipping and coal supplies during the most critical period of the war. For some months past Mr. Maguire was Acting Deputy General Manager of his company, and his handling of the subjects of the eight-hour day and standardisation of railway workers, the application of the new clerical classification, and many other intricate staff matters, has given entire satisfaction, both to this board of directors and to the employees.

Photo] [*Chancellor.*

MR. M. J. MAGUIRE,
General Manager,
Dublin & South Eastern Railway.

* * *

OPPORTUNITY was taken of one of the periodical meetings of the Railway Clearing House Superintendents' Conference to present Mr. Edwin Charles Cox, C.B.E. (Superintendent of the South Eastern and Chatham Railway), with a testimonial, consisting of a silver salver (suitably inscribed) with a silver tea set, in recognition of the excep-

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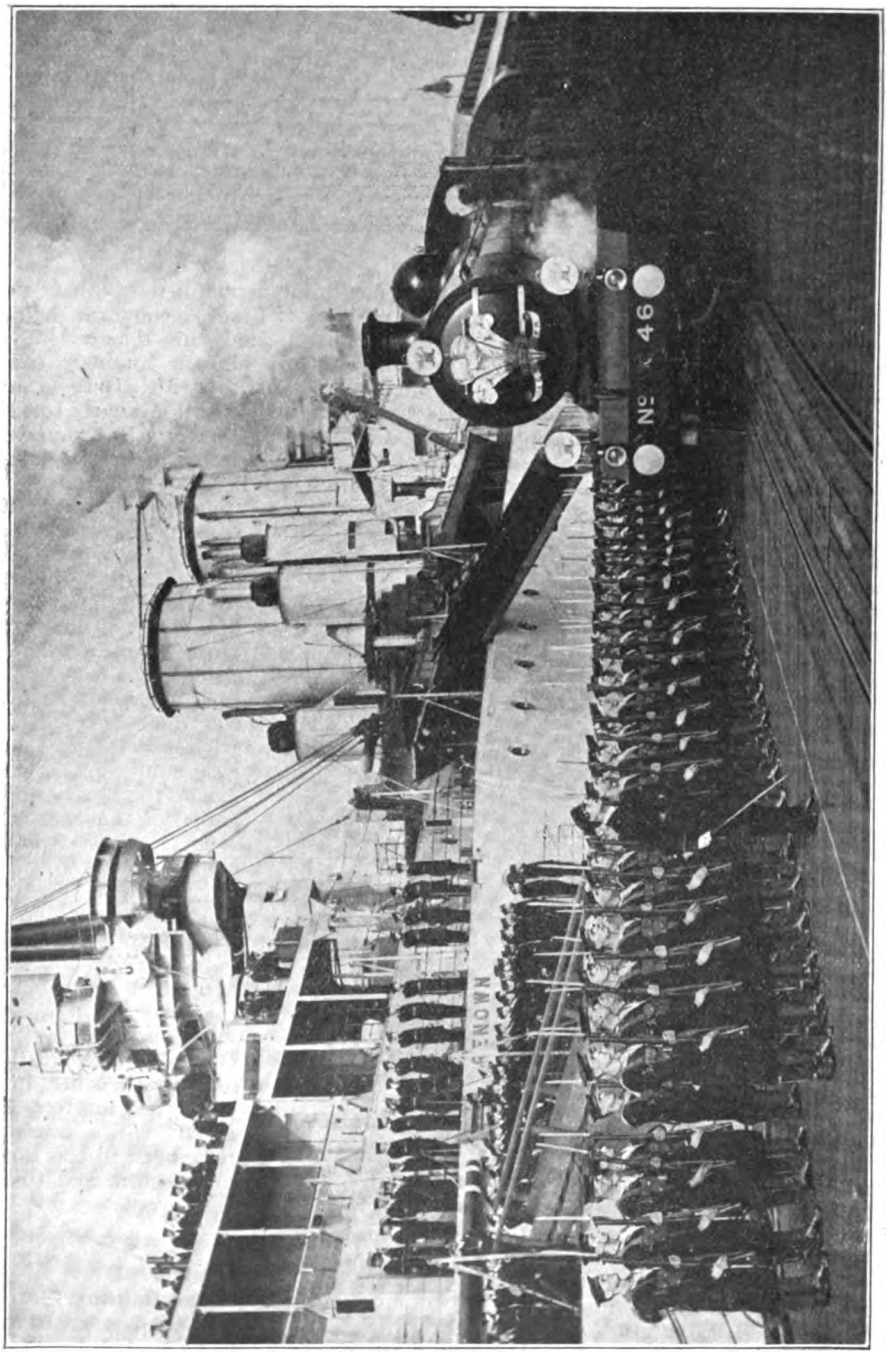

Photo.] **HOME-COMING OF THE PRINCE OF WALES.** [*Topical.*

Departure of Royal Train from Portsmouth Harbour, Monday, October 11, 1920.
London, Brighton & South Coast Railway 4-4-0 locomotive No. 46, "Prince of Wales."

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tional services rendered by him during his chairmanship of the Conference, which dates from April, 1919. Mr. H. A. Watson, C.B.E. (Superintendent of the North Eastern Railway), in asking Mr. Cox to accept the testimonial, said that the superintendents desired to show in a tangible form their regard for his personal qualities and their appreciation of the competent and tactful manner in which he had performed the duties which had devolved upon him in his capacity as chairman of the Conference. Mr. Watson also referred to the exceptional services which Mr. Cox had rendered on behalf of the railway companies generally in connection with the important questions which have been, and are, under consideration, particularly those connected with the staff negotiations, and with the evidence which he had given before the Rates Advisory Committee in connection with the interim increases in passenger fares and in the rates for conveyance of traffic by passenger train. Mr. Cox said he had much pleasure in accepting the gift, which had come as a great surprise, and that he felt exceedingly gratified at the compliment which had been paid to him by his colleagues, the superintendents of the various railways.

* * *

REGRET will be expressed at the announcement of the death of Mr. Francis H. Felton, who was very well-known and very popular in Brazilian railway circles. For 28 years he was in Pernambuco, being most of the time with the Great Western of Brazil Railway. On retiring from his position with that company, he spent a short time farming in the Argentine, but eventually returned to the work which was more attractive to him than any other, *i.e.*, railway management, and three years ago he joined the staff of the Sao Paulo Railway. In the middle of this year he was entitled to furlough, and he came to England to spend the time here with Mrs. Felton and their two children. Unfortunately, however, owing to an accident, which was followed by complications, Mr. Felton was obliged to spend the time in a nursing home, and although he had the greatest skill and kindness in the endeavour to alleviate his suffering his life could not be saved, and he passed away peacefully, early on the morning of October 10.

* * *

MR. C. G. C. FIGHIERA, son of Mr. F. Fighiera, Secretary of the Central Argentine Railway, Limited, has arrived in Argentina to join the traffic department of that railway. He served for a year in the various traffic sections of the Caledonian Railway, and was for a short time with Deloitte, Plender, Griffiths & Co., prior to his departure from Europe.

* * *

MR. E. F. MERRETT has been appointed by the directors of the Lancashire & Yorkshire Railway to the position of Works Manager at the Company's Carriage & Wagon Works at Newton Heath, vacant by the resignation of Mr. R. G. McLaughlin. Mr. Merrett for the last 11 years has been the Chief Draughtsman at Newton Heath, and prior to entering the company's service in 1903 had a wide experience in the design and construction of rolling-stock in the well-known car works at Oldbury, Langley Mill and Gloucester.

MR. E. F. MERRETT,
Works Manager, Newton Heath,
Lancashire and Yorkshire Railway.

Mr. H. O. Hill succeeds Mr. Merrett as Chief Draughtsman, and Mr. J. Airey has been appointed as Inspector of Materials. The new appointments take effect commencing October 1.

* * *

WE record with regret the death of Sir James Benjamin Ball, Chief Engineer to the London, Brighton and South Coast Railway, which took place on Thursday, September 16, at Forest Row (Sussex). Sir James Ball, who was in his 54th year, was appointed to his late position in 1917, in succession to Mr. C. L. Morgan. He joined the staff of the Great Northern Railway in 1890, and subsequently assisted

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Photo.] GREAT CENTRAL RAILWAY. [*W. H. Whitworth.*

Four-cylinder 4-6-0 engine No. 1164, "Earl Beatty" at Godley Junction.

in the construction, among other works of the Lancashire, Derbyshire, and East Coast Railway. In 1899 he became Engineer to the Lancashire, Derbyshire and East Coast Railway Company, which position he held until that railway was absorbed by the Great Central Railway, and in January, 1906, he was appointed head of the New Works Department of the Great Central Railway, and later, on the retirement of Mr. C. A. Rowlandson in 1911, he was made Engineer-in-Chief. In 1917 Sir James was appointed Controller of Timber Supplies, and in 1918 received the honour of Knighthood for his services. His portrait, painted by Stanhope Forbes, R.A., was exhibited in this year's Academy.

* * *

MR. HENRY EVANS, for 14 years Chief Goods Manager to the Midland Railway Company, who died on July 30, left estate of the gross value of £15,624, with net personalty £12,504. The testator left £50 to his "faithful secretary and private assistant, Albert Edwin Blount," whom he also named as an executor, as an acknowledgment of his unremitting and faithful service.

* * *

MR. B. BULLOCK, Manager of the Tilbury section of the Midland Railway, retired from active service at the end of September, having attained the age limit. In connection with the re-arrangement of the administration of that section, Mr. A. G. Swann has been appointed District Goods Manager of the section. Mr. Swann entered the service of the London, Tilbury and Southend Railway in the Goods Manager's Office in 1884; was made personal clerk to the then Goods Manager (Mr. C. A. Noble) in 1890; was appointed Chief Clerk in 1900, and continued in that capacity under the late Mr Edwin Chalk; and on taking over the line by the Midland, remained under Mr. Bullock in charge of the goods work.

* * *

IN connection with the final arrangements for merging the London, Tilbury and Southend Section of the Midland Railway into the general undertaking of the company, Mr. K. R. N. Speir has been appointed District Operating Superintendent and Mr. E. Whitby District Passenger Agent for that section. The headquarters of these officers will be at Fenchurch Street, and they will be responsible, in their respective departments, to the General Superintendent, Mr. J. H. Follows.

* * *

AT the Albert Stanley Institute, Hammersmith, Mr. J. Thornton was the recipient of a presentation made by the District Railway Athletic Association on the occasion of his retirement from the chairmanship of the above Institute. The presentation consisted of a silver tea and coffee service and an illuminated address.

* * *

MR. J. P. MONKHOUSE, who has been appointed Mineral Traffic Manager of the Great Western Railway, joined that service;

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in 1880. In 1889, at the time of the railway rates revision, he was appointed Personal Clerk to the then Goods Manager, Mr. Joseph Wilkinson, and afterwards served in a similar capacity with Mr. W. L. Maiden. In 1896 he was made head of a section of the Chief Goods Manager's Office, in charge of cartage work and important arbitration cases. In 1899 he was transferred to the General Manager's Department, first as Private Secretary to Sir Joseph Wilkinson, and afterwards, for a short time, to Sir James Inglis. In 1904 Mr. Monkhouse returned to the Chief Goods Manager's Office, under Mr. T. H. Rendell, being mainly concerned in Parliamentary work, agreements with other companies and special cases. In 1912 he succeeded the present Chief Goods Manager, Mr. C. A. Roberts, as head of the Goods Traffic Working Department, with the title of Assistant to Chief Goods Manager.

* * *

THE Canadian Pacific Railway announces that, from October 1, Mr. J. Springett is appointed Agent for Holland, with offices at 42, Coolsingel, Rotterdam, entrance 3A, Van Nessratat. Mr. G. L. Boer, who has been Acting Agent, will now resume his former position as Agent for the Department of Colonisation and Development.

* * *

THE annual dinner of the Railway Club will be held at the Holborn Restaurant, London, on Friday evening, December 17. It is expected there will be a large gathering of members from all parts of the country on this occasion, as the function will celebrate the twenty-first year of the Club's activities.

* * *

THERE was an excellent attendance at the October general meeting of the Railway Club in the new headquarters 65, Belgrave Road, S.W. 1. Mr. W. Parker presided, and announced the election of five new members. The feature of the evening was a paper by Mr. Basil M. Bazley on "Light and Narrow-Gauge Railways." A good discussion followed, and Mr. Bazley was highly congratulated. Among those who contributed to the debate were Colonel Burnett, Captain Edwards, Messrs. Cosgrave, Meacock, Miller, Bardsley, Newman and Stingemore. The latter member objected to some of Mr. Bazley's views concerning road transport. At the November gathering Mr. Ford-Stevens is to present a paper entitled "A Suburban Electric Train Service."

* * *

ON behalf of the Locomotive Inspectors' and Foremen's Institution the Hon. Sec. writes that 52 members visited, by the courtesy of Mr. Mitchell, managing director, the works of the Vacuum Brake Company (Messrs. Gresham and Craven), at Manchester, on Saturday, September 25, being shown over the works by Mr. P. Gresham, who also addressed the members on the vacuum brake. A discussion afterwards took place, and an instructive and interesting meeting was held. The members were also entertained to tea by the company.

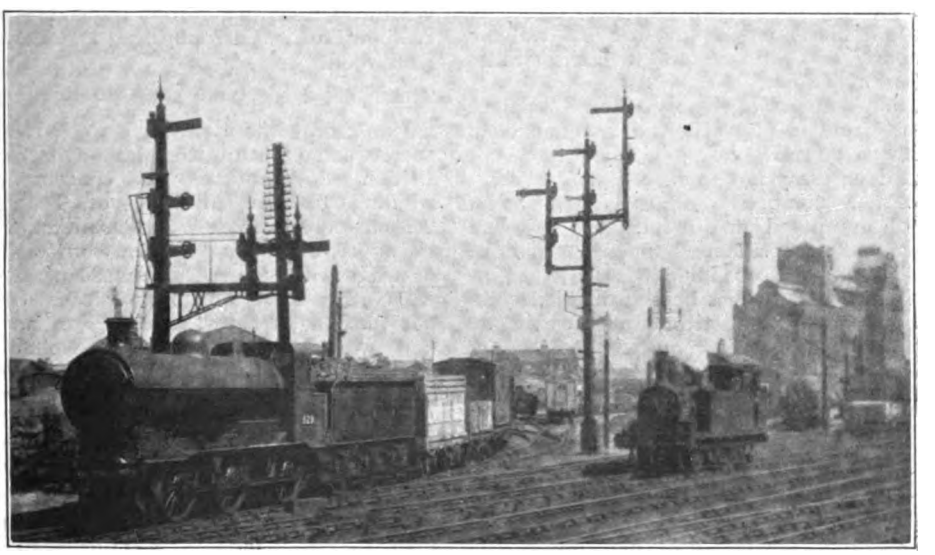

Photo.] A FAMILIAR SCENE AT CAMBRIDGE STATION. [*G. H. Cannon.*

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He adds that the annual meeting of the Institution will be held on Saturday, October 23, at the Ambulance Room, South Eastern and Chatham Railway, Victoria Station, London, at 3.0 p.m., and the first meeting of the season 1920–21, will be held on Saturday, November 27, in the same hall, when Mr. R. P. C. Sanderson, M.I.L.E., of the Baldwin Locomotive Works, will read a paper on "Acetylene Welding in Locomotives."

* * *

NEVER weary in well doing, the London "Safety First" Council is endeavouring to enlist the rising generation into its ranks. A competition has been devised by the Council with a view to stimulating the interest of railway workers by offering awards to their children for essays bearing upon the prevention of railway accidents. Incidentally, it may be remarked that the railway men of to-day are largely the sons of the previous generation of railwaymen, and it may be anticipated that a very large proportion of the present children of railwaymen will, in due course, enter the railway service. The conditions of the competition are :—

1. The competition, to be known as "The London 'Safety First' Essay Competition for Children of Railway Employees."

2. *The Object of the Competition.*—To encourage, by the award of prizes and certificates, special interest in "Safety First" principles by children of railway employees.

3. The competition to be open to boys and girls under 16 years of age, either of whose parents is employed by a railway company and who resides within 20 miles of Charing Cross.

4. The subject of the essay to be "Safety First," and deal with the avoidance of accidents on railways.

5. Each essay not to exceed 500 words.

6. If a competitor desires, an *original* sketch, prepared unaided by the essayist, showing how accidents happen or may be avoided, may also be included.

7. Each essay must be the unaided composition of the competitor, and a certificate to this effect will be required from one of the essayist's parents. Compositions must consist of original matter and be as concise as possible. Quotations, if employed, must be marked with inverted commas. Each page of the essay must be numbered.

8. When judging essays and sketches, regard will be paid to the ages of the competitors.

9. Entry forms can be obtained gratis from the Joint Hon. Secretaries, London "Safety First" Council, 2–3, The Sanctuary, Westminster, S.W. 1.

10. No fee to be payable in respect of the Competition.

11. Essays, enclosed in envelopes marked in top left-hand corner "Railway Essay," must be sent to the Joint Hon. Secretaries, at the above address, *not later than November* 30, 1920.

12. Prizes to the value of £20 will be awarded, irrespective of the sex of the essayist, as follows :—

First, £3 ; Second, £2 ; Third, £1 ; 14 at 10s. each, and 28 at 5s. each.

* * *

A MOST serious development in the history of the munitions dispute on the Irish railways took place on September 20, when the Great Northern Railway Company suspended all traffic on the 62 miles of its system between Dundalk and Enniskillen and on the 16 miles of branch line by which Cootehill and Carrickmacross are served.

* * *

FOLLOWING are the leading winners in the Glasgow and South Western Railway's competition for the best kept and most attractive platform flower gardens or borders at stations, the names of the stationmasters and stations being given :—First class (£5 each)—Messrs. Charles Auld, Alloway ; John Aitken, Drybridge ; William Nicholson, Maxwelltown ; John Inglis, Dalmellington ; James Dunlop, Cunninghamhead ; John O'Hagan, Castle-Douglas; William Patterson, Glenside ; Thomas Coyle, Dalbeattie ; John Winthrop, Sanquhar ; John Inglis, Maybole ; William Laurie, Carronbridge ; David Kelly ; Holywood.

* * *

IN a recent interview, Sir Eric Geddes said there was no truth in the statement that the British Government was contemplating winding up the Ministry of Transport. "I can only suppose," he continued, "that the story originates in some confused idea of what will happen in August next year, when the Government guarantee of the net receipts of railways comes to an end, and when the accounts are wound up. To-day we are responsible for the correct accounting on behalf of the community of many hundreds of millions per annum. When the accounts are closed, that responsibility ceases. We are proceeding according to plan. It is hoped to introduce a Bill before the New Year dealing with the future of railways, and this is being drafted. It will follow broadly the lines of the White Paper which was issued, outlining the

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Government's proposals. The scheme will, of course, be criticised. It was with that object that it was issued in broad skeleton as a White Paper and not as a draft Bill. The railway companies as a whole are not yet expressing their views, but, so far as the grouping proposals are concerned, these in very large measure follow the natural lines of amalgamations which the railways have sought or desired before the war. In many very important cases I have had discussions with the interests of the proposed groups, and I am not aware of any great hostility to the scheme; in fact, the economies which are being forecasted as a result of the Government's policy are more than encouraging. We are reaching a stage when I hope we will be able to make a commencement with prudent agricultural railway developments. The Electricity Commissioners are proceeding with their work methodically and assiduously. The classification of roads—which will give us through main routes on a uniform standard—is being pressed forward by the local authorities, from whom we receive the fullest co-operation. Far from there being any signs of the Ministry's early demise, it is being appealed to every day to an increasing extent for assistance in difficult questions of transportation, and is becoming more useful as time passes and its activities bear fruit. Between now and next August we have a legislative programme of no mean dimensions."

* * *

IT is expected that by the end of the year the Edge Hill Light Railway will be ready for opening. This line will serve a large Oxfordshire ironstone district, and it is anticipated a very heavy traffic will be carried. The Edge Hill Light Railway will connect at Burton Dassett with the Stratford-upon-Avon and Midland Junction Railway.

* * *

WITH the reduced demand for up-river and similar pleasure traffic there was a considerable reduction of the Sunday passenger train services over the electrified portion of the North London Railway between Broad Street and Richmond, commencing on October 10, 17 trains in each direction being discontinued. The early morning week-day train at 4.15 from Bow Road to Broad Street has also been taken off.

* * *

THE International Transport Workers' Federation announces that the International Congress of Railwaymen will meet on November 29 in London. All organisations affiliated to the International Transport Workers' Federation are invited to attend. The chief subject for discussion will be the means to bring about the rapid introduction of an eight-hour day in the railway industry in all countries.

* * *

THE Metropolitan District Railway has on order 100 cars for eight-car trains. The first eight-car train is due for delivery by the end of October, and it is hoped to put on 60 or 70 of the 100 cars ordered by the end of 1920.

* * *

REVISED fares on the Underground, the tramcars and the motor omnibuses came into force on Sunday, September 26, and the first result of the alterations was a hunt for halfpennies, and the booking clerks and conductors had a harassing day.

* * *

THE head offices of Siemens Brothers & Co., Limited, and of Siemens Brothers Dynamo Works, Limited, will be removed shortly from Palace Place Mansions, Kensington, London, W.8, to Caxton House, Westminster, London, S.W.1.

* * *

WE have just received a copy of the latest London and District edition of "The Homestead," which should prove invaluable to the house-seeker and those who wish to tour the charming country, rich in sylvan beauty, served by the Great Central Railway. This guide, well illustrated, excellently written, and containing valuable local information in regard to the places described, can be obtained at any Great Central suburban station and town office, or direct from the Superintendent of the Line, Marylebone Station, N.W.1, price 3d., by post 2d. extra.

* * *

FROM the American Chamber of Commerce in London, we have received a copy of their Year Book for 1920, containing the names and addresses of more than 1,000 British and American firms, and individuals interested in developing business between the two countries, classified to form a useful commercial directory. Price is 2s., and copies can be had from 8, Waterloo Place, London, S.W. 1.

* * *

DESCRIBING the steamship *Prinses Juliana* on page 269 of the October RAILWAY MAGAZINE, the depth of the vessel was, by a printer's error, incorrectly stated. It should be 25·10 feet.

* * *

BRITISH locomotives sent overseas had their adventures. Midland engine No. 2717,

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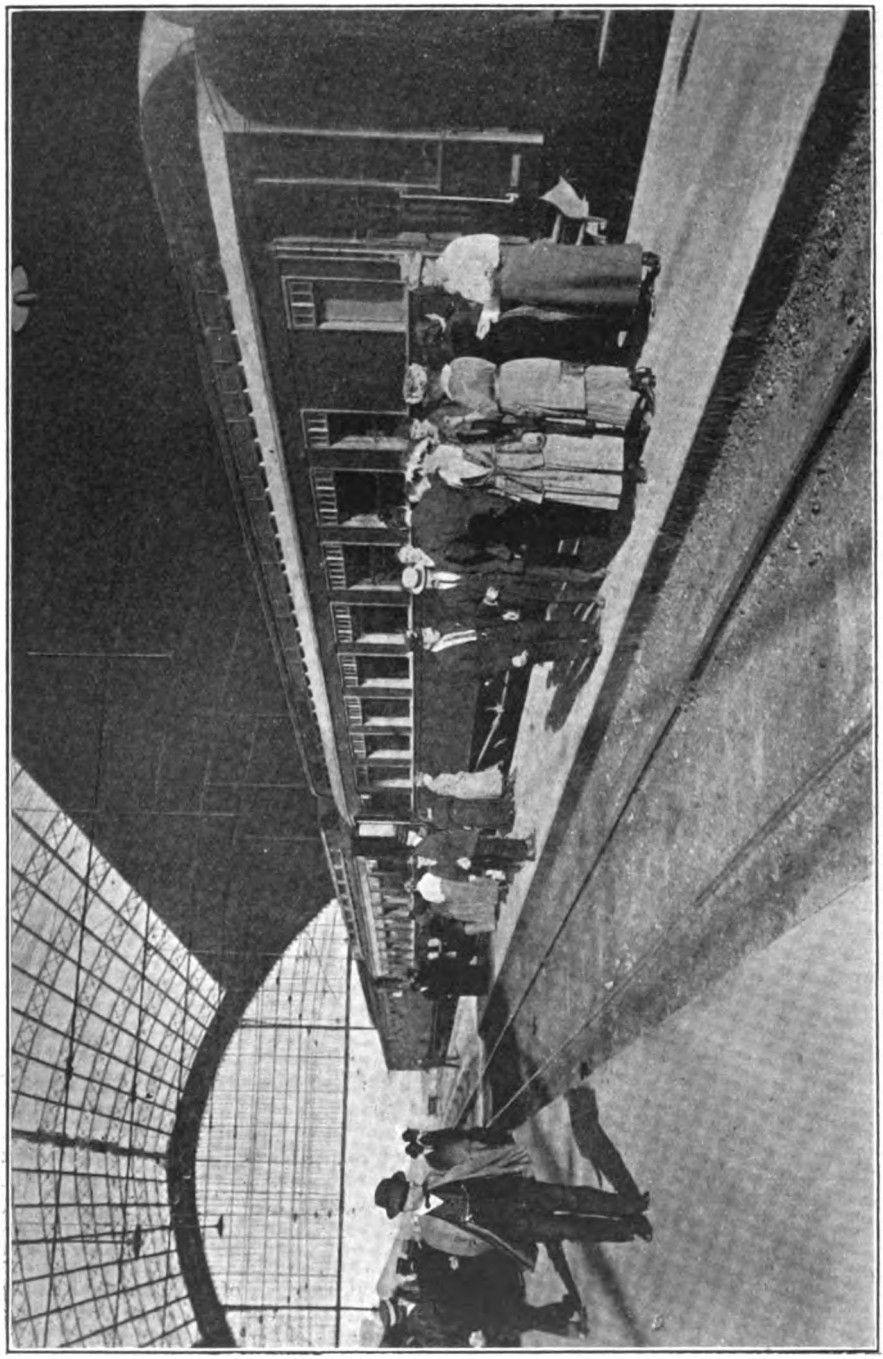

ROME STATION, SHOWING TRAIN INCLUDING CANADIAN PACIFIC RAILWAY OBSERVATION CARS RECENTLY PURCHASED BY THE ITALIAN STATE RAILWAYS.

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captured by the Germans and eventually re-captured by the Allies, has been returned to the Midland Railway and put into service. A plate is being prepared and will be affixed to the engine giving a brief history of its movements during the war.

* * *

UPON the outbreak of war the Austrian Government seized the observation cars which the Canadian Pacific Railway had been operating in connection with the Austrian State Railways from Buchs to Vienna and Trieste. These cars were used by the Austrian Government during the war for some time as Red Cross carriages, and on the cessation of hostilities were handed back to the Canadian Pacific Railway in pretty good shape. Recently they have been sold by the Canadian Pacific to the Italian State railways, and are now being operated by the Italian State railways through many of the Italian beauty spots. They were used for the first time for a party organised by the Moreli Company of Rome for the transportation in Italy of the delegates of the National Council of Women of the United States proceeding to the International Feminist Meeting in Christiania. They left Naples on August 21, and proceeded via Rome to Florence, Venice and Milan to Geneva, where they arrived on August 28. The operation of these observation cars for the first time on the Italian State railways created a great amount of interest, and aroused intense admiration on the part of the people and the railway officials. An illustration of the cars is given on page 360.

* * *

ON the London, Brighton and South Coast Railway, commencing October 1, new trains have been run between Victoria and Brighton every week-day from Victoria at 3.10 p.m. and from Brighton at 5.45 p.m. These trains consist of 1st and third-class Pullman cars and third-class carriages only.

* * *

THE Electrification of Railways Advisory Committee, appointed by the Minister of Transport in March last, has made an interim report which was published on September 29 by H.M. Stationery Office. The Committee, after examining representatives of various railway companies and electrical contracting firms, and receiving expert evidence from abroad, are unanimously in favour of standardisation, both of methods and appliances. The direct current system is favoured for general adoption but it is not proposed that the electrical system of working at present in use or actually under construction on the London, Brighton and South Coast Railway need be changed.

* * *

IN reference to notes already given concerning exceptionally "easy" gradients, Mr. H. C. Randle mentions one on the London and South Western Railway, between Sturt Lane Junction and Farnborough, extending from near the 32¼ to the 32¾ mile posts, at 1 in 14,000.

* * *

A NEW series of four-cylinder "Claughton" class locomotives has recently appeared on the London and North Western Railway, as follows:—Nos. 484, 1407, 1726, 1741, 1747, 2035, 2083, 2231, 2268 and 12. Of these, 484 is stationed at Preston; 1741 and 1747 at Longsight, and the remainder at Crewe. A further batch of similar engines will shortly be put in hand; the first six will be Nos. 85, 98, 103, 201, 499, and 808. No. 1975, *Jupiter*, is the latest four-cylinder compound passenger engine to be altered to two-cylinder simple, "Renown" class. Nos. 55 and 435, 0-6-2 tanks, have been fitted up for working motor trains. No. 2059, the last of Mr. Webb's 5-ft. compound goods engines ("1400" class), has been broken up. Engines stationed at Warwick now carry the shed-plate No. 11, and those at Coventry (which is now under Warwick) the shed-plate No. 11C. Both these sheds were previously under Rugby.

* * *

IN the article published last month on "Locomotive Re-building at Kilmarnock Works: Glasgow and South Western Railway," by an error it was stated that the 4-4-0 engines referred to were built at Kilmarnock Works in 1879. This should have been 1897. In regard to the rebuilt 4-6-0 engines, the fire-boxes are now 8 ft. 9 in. long, instead of 8 ft.

* * *

IT is stated in Paris that negotiations are at present being carried on between the Foreign Office and a Siamese plenipotentiary with regard to a treaty which, if concluded, will be of considerable economic importance. This treaty will include the fixing of the frontiers, hitherto somewhat indefinite, between Siam and Laod, the conclusion of commercial agreements, and finally the determination of the conditions in which a railway might be built linking up Saigon with Bangkok, and consequently with India. Pourparlers have been proceeding for several months, and it is stated that they are about to have a definite result.

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ACCORDING to a continental correspondent work has been recommenced on Berlin's new underground railway, the North-South line, the construction of which was begun before the war. The North-South will be Berlin's first completely underground line, as the present "Underground" is for a considerable distance an open-air overhead railway. It is not expected that the line will be completed before 1923.

* * *

ON Monday, October 18, the Institute of Transport held its first general meeting for the session 1920–21, at the Institution of Civil Engineers, Great George Street, London, S.W.1, when a presidential address was given by the Right Hon. Lord Ashfield, of Southwell. On November 29 a paper is to be given by Mr. E. S. Shrapnell-Smith, C.B.E., on "Economics and Co-ordination of Transport by Road."

* * *

ON Tuesday, October 12, Mr. Robert Allen, the Managing Director of Allen & Simmonds (Reading), Limited, placed before a large assembly of pressmen a number of noteworthy facts relating principally to the new "Allen" patents in piston construction, applicable equally to motor cars and other internal combustion engines, and to steam engines of locomotive, marine and stationary types. Mr. Allen proved an excellent lecturer, and we hope in a subsequent issue to describe the principles of his specialities.

* * *

THE Australian rail gauge question is again coming strongly to the fore, the latest proposal being that the 5 ft. 3 in. gauge should be continued from Albury alongside the New South Wales 4 ft. 8½ in. track to Sydney, thus completing 5 ft. 3 in. gauge all the way from Adelaide to Sydney; if need be, with a view to Melbourne coal traffic, this might be continued onwards to Newcastle. Extension of the New South Wales 4 ft. 8½ in. track from the border to Brisbane, a distance of only 108 miles, would also greatly facilitate transport, between Queensland and the more southern States. Meanwhile, a Commission is to be appointed to inquire into the best gauge for use in Australia, and the cost of providing a uniform gauge between the capital cities only, or in regard to the whole of the railway systems.

* * *

THE Australian *Sunday Times*, dated July 4, 1920, contains a special page devoted to the evolution of New South Wales Railways, and was published in connection with the tour recently made by the Prince of Wales over the railways of New South Wales. The article illustrates the great change in railway travelling in the State since the first train ran out of Sydney to Parramatta, and details of the development of the magnificent equipment that carried the Prince of Wales during his recent tour. Several noteworthy pictures are given of old type engines and stations. One of particular note is that depicting the cutting of the first sod in connection with the first Australian railway at Sydney on July 3, 1850.

* * *

THE Queensland Government is proceeding apace with the development and extenslon of the railways in that progressive and fertile Australian State. A further section of the North Coast Railway, from the Styx River to Wumalgi, 94½ miles from Rockhampton, was opened on August 5. It is estimated that the section to Mackay will be opened in August, 1921, to Townsville in March, 1922, and to Cairns in 1923. The total distance of the line from Rockhampton to Cairns is 645 miles, of which 205 miles remain to be built. The section at the Mackay end to Carmilla Creek has also been opened, making 5,700 miles of railway in Queensland. The total cost of this line has so far been £2,500,000, and the estimated cost to complete it is £13,000,000 When the line is finished, it will be possible to travel by rail from Cairns to Perth, a distance of over 4,000 miles.

* * *

"THE whole future of the railways is in the balance. During the next nine months we are going to have a most critical and laborious time. We shall have long negotiations with the Ministry of Transport, and, if these fail, the greatest Parliamentary fight we have ever seen." This statement was made on October 13, by Sir A. K. Butterworth, general manager of the North Eastern Railway. He presented to the Railway Rates Advisory Committee a scheme designed to place the railway systems of the British Isles on a basis that will yield a return of 5 per cent. on the capital employed. Sir John Simon pointed out that the rates now in force will continue—subject to any alteration that Parliament may sanction—until February 15, 1923, and after that date until new scales are accepted. The railways proposed that a new tribunal should be established by August next to examine and revise their proposals. Sir William Plender, said if a return of 5 per cent. on all railway capital was to be obtained it would be necessary for the companies to increase their revenue by £10,000,000, an increase of 4 per cent. on the 1920 revenue of £241,000,000.

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THE RAILWAY MAGAZINE.

4-4-4 SUPERHEATER TANK ENGINE, METROPOLITAN RAILWAY.

Designed by Mr. CHARLES JONES, Chief Electrical and Mechanical Engineer.

Fitted with Belpaire Boiler, Wakefield Mechanical Lubricator, Robinson Superheater, etc.
Cylinders, 19 in. by 26 in. Coupled Wheels, 5 ft. 9 in diam. Bogie Wheels, 3 ft. diam.
Heating Surface: ordinary tubes, 765 sq. ft.; flue tubes, 281 sq. ft.; superheater, 268 sq. ft.;
firebox, 132 sq. ft.; total, 1,446 sq. ft. Steam Pressure. 160 lbs. per sq. in.
Grate Area, 21·4 sq. ft. Weight in working order, 77 tons.

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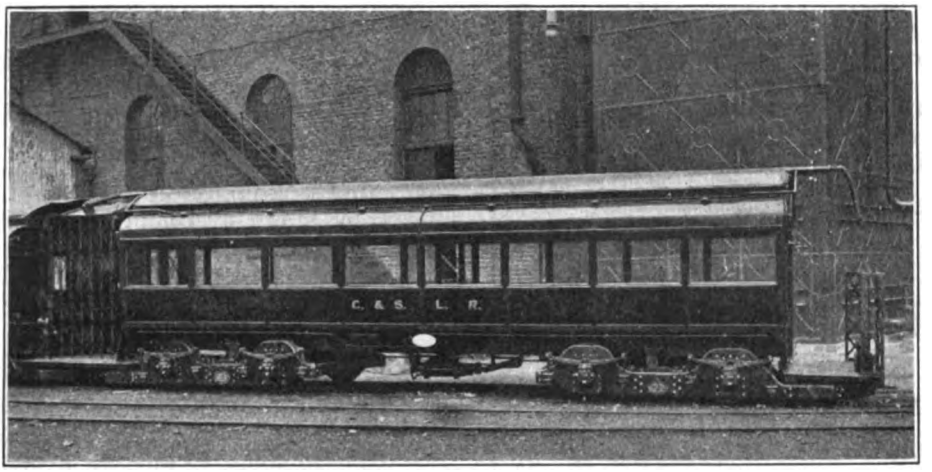

STANDARD PASSENGER CARRIAGE.

Built by the Brush Electrical Engineering Co., Ltd.

The World's Pioneer Tube Railway.

By H. L. HOPWOOD.

IT is difficult to realise the fact that the City and South London Railway—the oldest tube line in the world—has been in operation for the long period of thirty years. From the beginning a course was pursued which was then unique and entirely experimental, and the broad principles of working originally adopted remain in use, practically unaltered, at the present time. The railway is, however, to be reconstructed and brought more into line with the other "Underground" systems of London; this means that the City and South London will lose many of those features which place it in a class entirely apart from other electrically-worked lines built subsequently, and it seems opportune to record in these pages the history and progress of this, the world's pioneer tube railway.

Under the title of the City of London and Southwark Subway, the railway was authorised by an Act of Parliament passed in 1884. At that date some of the most densely populated districts south of London Bridge were served only by tramways and omnibuses; and it was with the object of providing better travel facilities that the new railway was promoted. In the first instance it was proposed to construct a deep-level railway from King William Street to Elephant and Castle only, but an Act passed in 1887 authorised an extension from the latter point to Stockwell.

The original Act stipulated that "traffic shall be worked by means of carriages propelled upon the system of the Patent Cable Tramways Corporation, or by such means, other than steam locomotives, as the Board of Trade may from time to time approve." There were to be two endless cables—one between King William Street and Elephant and Castle working at 10 m.p.h., and another between Elephant and Castle and Stockwell working at 12 m.p.h., but during construction of the line so much progress had been made in methods concerning electric traction that it was decided to use electricity as the motive power in preference to cable haulage.

To that eminent engineer, the late James Henry Greathead, the City and South London, and all underground railways that followed it, owe their existence. At an early date Mr. Greathead foresaw the congestion of street traffic in London and advocated deep-level railways as a means

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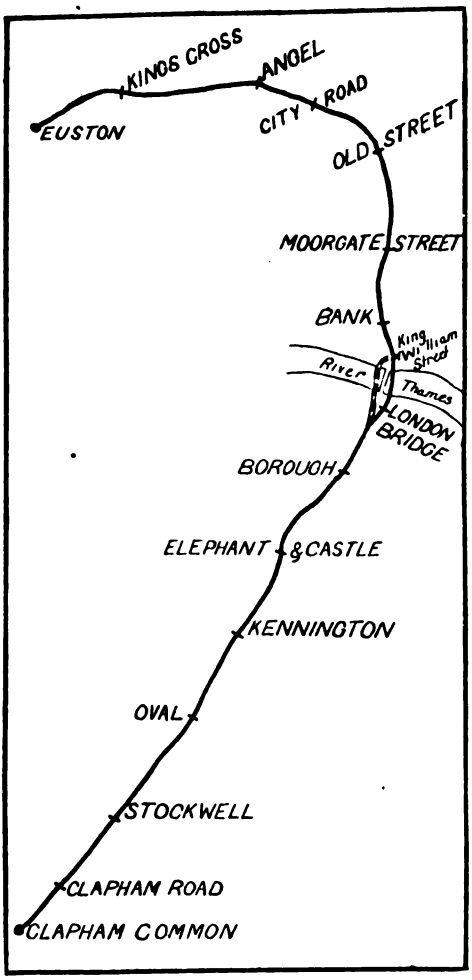
of providing relief. He is, however, best known as the inventor of the Greathead tunnel shield. As used on the City and South London Railway, this shield consisted of a cylindrical casting 2 in. larger in diameter than the cast-iron lining of the



PLAN OF CITY & SOUTH LONDON RAILWAY.

Showing also Original Line to King William Street Terminus.

tunnel. Bolted round this casting were six hydraulic rams, with piston heads bearing against the iron lining of the tunnel behind. The front of the shield was formed of segmental castings on which were fixed adjustable steel plates with conical cutting edges. As the material was excavated and thrown back through an opening in the shield, the latter was pushed forward by the action of the rams, and in the space thus left were fitted further cast-iron rings under cover of the cylindrical casting. These rings, of course, formed the iron lining of the tunnel. The small space excavated outside them was filled up with "grouting"—a mixture of blue lias lime and water forced by compressed air in a grouting apparatus through holes made in the segments for that purpose. The tunnels—circular in section—were only 10 ft. 2 in. in diameter north of Elephant and Castle and 10 ft. 6 in. in diameter from that station to Stockwell. At places where the tunnels passed through water bearing strata, compressed air was used.

Starting in the City at right angles to King William Street, and at a depth of 70 ft. below the surface, the railway ran, by means of a sharp curve, under Arthur Street West and Swan Lane to the Thames, passing on the west side of London Bridge. This route was taken in order to avoid the foundations of the bridge. On reaching the Surrey side it curved again to the left so as to be in line with, and under, the main road leading to Stockwell.

The contract for the City section being let to Mr. E. Gabbutt, of Liverpool, work was commenced in May, 1886, by sinking a shaft in the Thames behind Old Swan Pier, and construction of one tunnel started in the following October. The second tunnel was begun in March, 1887, and by June both tunnels were completed under the river. In August, 1887, the contractors for the southern section, Messrs. Walter Scott and Co., of Newcastle, commenced operations at Kennington, the Oval and Stockwell. By February, 1890, work was sufficiently advanced to admit of the running of experimental trains, and inauguration of the line by King Edward VII, then Prince of Wales, followed on November 4. Finally, the railway was opened for public traffic from King William Street to Stockwell, a distance of 3 miles 12 chains, on December 18, 1890.

There were separate tunnels for each line, and an unusual feature was the different positions they occupied relatively to each other, *e.g.*, at Swan Lane the up line tunnel was immediately above that of the down line, the clearance between them being only 4 ft. 6 in. Under the river, and for some distance south, they

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were side by side, but not in the usual position, the down, or south bound, line being to the west of the up line. At a point where Borough Road joins Newington Causeway (midway between Borough and Elephant stations) the up line crossed over the down, and thereafter they occupied a normal position.

At stations all tunnels were of oval section. Those at the termini were 26 ft. wide and 20 ft. high, but at intermediate stations they were 20 ft. wide and 16 ft. high. Except at King William Street and Stockwell, each line where it entered a station had its separate tunnel and platform. Originally, King William Street station had a single track with platforms on either side, one for departure and the other for arrival. At Stockwell there was an island platform, the two tracks being connected at the north end by a scissors crossover. About the year 1893, King William Street station was remodelled on the same plan as that adopted at Stockwell. The only intermediate communication between the up and down lines was a lay-by siding and crossover road at the north end of Elephant and Castle station.

Station lifts were worked by hydraulic power, the pumping engines being at Stockwell power house, where the pressure in the main was about 1,200 lb. per sq. in. The pressure and return-water pipes were carried along the side of the tunnels. Sir W. G. Armstrong, Mitchell & Co. were responsible for the installation of hydraulic machinery.

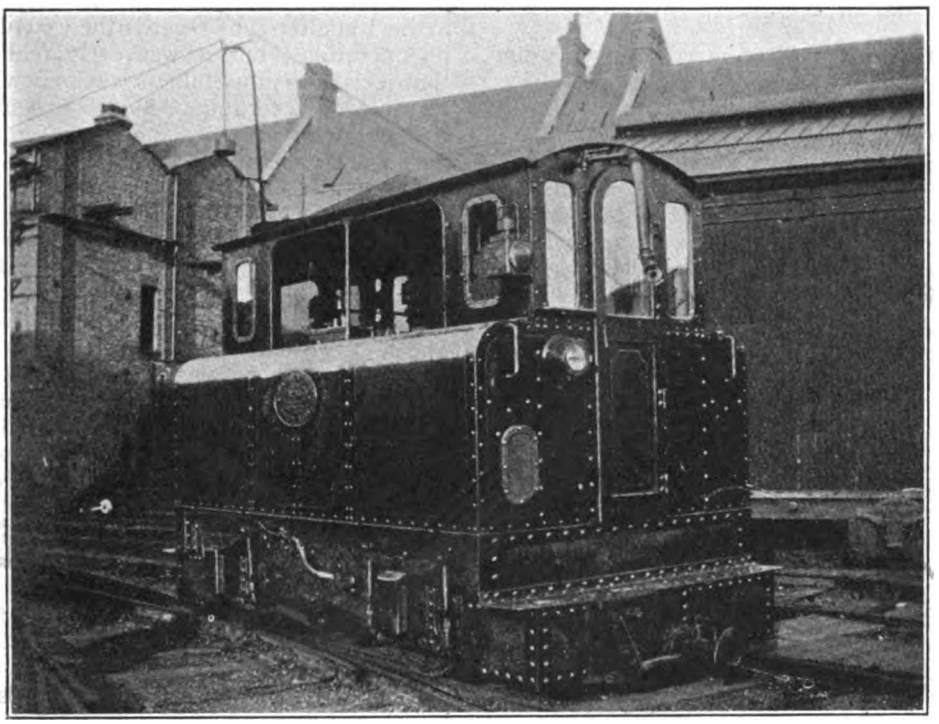

Photo.] No. 10, "PRINCESS OF WALES." [*F. H. Stingemore.*

Original class of locomotive, as rebuilt 1905.

Where conditions made it possible, the line was so graded as to secure rapid acceleration of trains at starting and minimum use of brake power when stopping. This principle has often been advocated, but the City and South London was the first railway to put it into practice. The following table of gradients shows to what extent this system was adopted.

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Approaching Grade of 1 in	Station.	Leaving Grade of 1 in
	DOWN LINE.	
— —	King William Street	... 40, 14, 36 F
(Level) ...	Borough ...	... 35 F
200 R ...	Elephant and Castle	...115 F
395 R ...	Kennington ...	...267 F
83 R ...	Oval	... 31 F
105 R ...	Stockwell ...	... — —
	UP LINE.	
— —	Stockwell ...	... 43 F
83 R ...	Oval	... 27 F
95 R ...	Kennington ...	... 25 F
(Level) ...	Elephant and Castle	... 85 R
70, 40 R	King William Street	... — —

F = Falling. R = Rising.

These grades occurred only in short lengths; otherwise the line was practically level.

The Stockwell power house, repair shops and carriage sheds were approached from the railway by a curved line having a gradient of 1 in 3½. Up this incline, empty trains were hauled by a winding engine. The original generating plant comprised three belt-driven Edison-Hopkinson dynamos and three compound inverted engines of 375 i.h.p. A fourth set was put down shortly afterwards. These engines had cylinders 17 in. and 27 in. by 27 in. and flywheels 14 ft. in diameter, making 100 r.p.m. The boiler house contained six Lancashire boilers each of 7 ft. diam. and 28 ft. long, and these supplied steam at 140 lb. pressure. The engines were made by John Fowler & Co., of Leeds, and the electrical plant by Mather & Platt, of Salford, the latter firm also being responsible for the first 14 locomotives. Later on, a fifth engine and generator were added at Stockwell. This was a Willans-Siemens high speed, direct-coupled set and the first of its kind used in electric traction.

For the first ten years the railway was worked on the two-wire system of distribution at 500 volts. When first laid, the conductor rail was of light section and insulated by means of glass blocks secured to the sleepers. The permanent way was formed of flat-bottomed rails weighing 60 lb. to the yard. No ballast was used and the cross sleepers rested on the iron lining of the tunnel.

The ordinary block system of signalling was installed originally, but very soon some modification of this became necessary, and intermediate signals, electrically worked by the passage of a train, were fitted on the longer sections. By these means a train could leave a station before the preceding train had reached the signal box in advance.

In 1890 a standard train consisted of three coaches, and a five-minutes' service was worked, the journey from end to end occupying 15 minutes. In the first instance, a uniform single fare of 2d., payable at turnstiles, was adopted, but shortly afterwards some adjustment of this was made. No tickets were issued, except in the case of return journeys.

For nearly 10 years the railway remained unaltered as regards the extent of its operations, but it was early realised that its sphere of usefulness was somewhat restricted. Accordingly, Acts were sought and obtained in 1890 and 1893 for extensions from Stockwell to Clapham Common and from the Borough to Islington respectively. The present title of the company was also adopted by the earlier Act. Work on these extensions was taken in hand by two firms of contractors, Messrs. J. Mowlem & Co. being responsible for the northern section as far as Moorgate Street, and Messrs. W. Rigby & Co. undertaking from that point to Angel station, Islington. At about the same time the latter firm also commenced operations on the Stockwell-Clapham Common contract.

Owing to the approach to King William Street being on a sharp curve with heavy gradients (1 in 14 at one place on the south bound road) and also to the fact that the station lay-out was from east to west, it was necessary, in planning the northern extension, to abandon this section and construct the new line from a point just north of Borough station. This necessitated another set of tunnels under the Thames on the east side of London Bridge. Building the Bank station was a difficult matter as the site chosen was immediately beneath the Church of St. Mary Woolnoth, the whole of the foundations of which had to be removed and replaced by steel girders.

It will be remembered that on a portion of the old line, the tracks occupied reverse positions in relation to each other, and when the new line was built a similar location had to be adopted for some distance, but between the Bank and Moorgate Street the tunnels cross and resume their usual situation. Intermediate crossover

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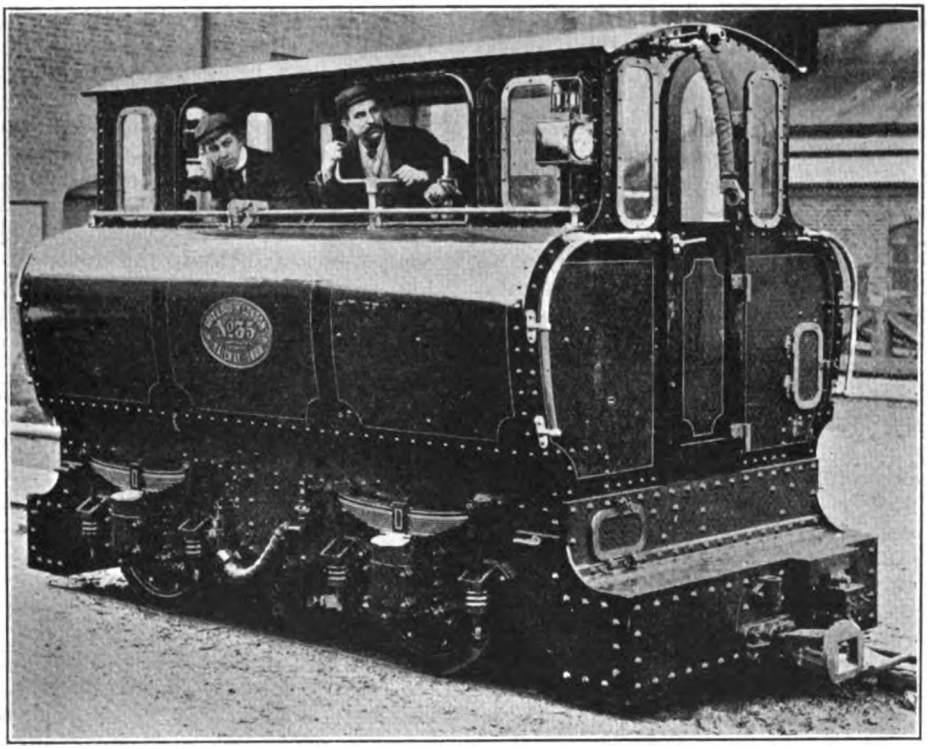
roads were provided at London Bridge and Moorgate Street. Angel station, the northern terminus for some years, had the usual terminal lay-out, viz., an island platform with scissors crossover, all contained in one large tunnel 30 ft. in diameter. A similar arrangement was adopted at the Clapham Common terminus on the southern extension. On this section there was an intermediate station at Clapham Road situated in a 30-ft. tunnel and having an island platform. In respect of diameter, these tunnels were the largest in the world. Between stations, tunnels were of the standard 10 ft. 6 in. bore. Heavier permanent way was adopted on the new lines; flat-bottomed 80-lb. rails being substituted for the 60-lb. rails laid when the line was opened. Conductor rails were also larger, weighing 40 lb. to the yard and supported on porcelain insulators instead of on glass blocks as at first. The whole of the original permanent way has, of course, long since been brought up to modern standards.

Gradients on the extensions were more severe than on the original line. On the north bound track there were short-distance falls at 1 in 30 when leaving Clapham Common, Clapham Road, London Bridge and the Bank, but apart from these, there was a general upward tendency from London Bridge towards the Angel, chiefly at 1 in 92, 100, 130, 150 and 170. The south bound line had several short lengths falling at 1 in 30, and where the south bound tunnel crossed beneath the other (between Moorgate Street and the Bank) the grade was 1 in 42, falling for 316 yards.



LOCOMOTIVE No. 35, AS NOW RUNNING.

On February 25, 1900, the northern extension was opened as far as Moorgate Street, with intermediate stations at London Bridge and the Bank, and on the same date the portion of original line from Borough to King William Street became disused. A few months later—on June 3—the Clapham Common extension was brought into use. Some time elapsed before completion of the Moorgate Street–Angel section (with two inter-

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mediate stations), but it was finally opened on November 17, 1901.

The addition of a head and tail to the original system brought about many alterations in working. A more frequent service was operated and trains were lengthened from three to four coaches each. The old system of fares, payable at turnstiles, was abandoned, partly on account of through bookings with other railways being instituted. The Stockwell power station, which had been in use since 1890, was unequal to the demands now made upon it, and to meet the new conditions large extensions to the property were made and a new power station was built. This contained two compound horizontal Corliss engines, supplied by Messrs. Cole, Marchent & Morley, of Bradford, and having cylinders 24 in. and 48 in. by 48 in. The flywheels were 24 ft. in diameter and weighed 40 tons; the sides being formed of dished steel boiler plates. Each of these engines drove an 800 k.w. compound-wound generator. There were also four Willans high-speed engines, two of which were coupled to six-pole dynamos of 300 k.w. each. The third engine drove a four-pole generator of 125 k.w., whilst the fourth worked a Siemens 125 k.w. set which had been removed from the old power station. With the exception of the last-named, all generators were of the Electric Construction Company's make. When the line was opened to Islington in 1901, a seventh engine and dynamo were added. This set consisted of a Ferranti engine of compound vertical inverted type, having cylinders 20 in. and 36 in. by 15 in. and driving an E.C.C. generator of 400 k.w. At a later date it was sold and replaced by an 800 k.w. cross-compound vertical Ferranti E.C.C. set of practically the same type. The several units differed in size on account of their having to generate a varying output of power required during the day. Including necessary auxiliaries, the total power was 3,250 k.w. Steam was supplied by 14 of Messrs. Davey, Paxman & Co.'s Economic boilers. These were 8 ft. 9 in. in diameter and 15 ft. 6 in. in length and worked at 160 lb. pressure.

Under altered conditions, the original two-wire system of working at 500 volts was no longer practicable, and between Clapham Common and Borough the method of distribution was changed from the two-wire to the three-wire system with 1,000 volts across the outers, the running rail forming the middle wire. This three-wire system, although common in electric lighting, was unique in traction, the City and South London being the only railway to adopt it. For serving the line north of Borough, sub-stations were built at London Bridge and Angel, and these were fed on the five-wire system with 2,000 volts across the outer conductors. Although distribution was effected at 2,000 volts, the maximum across any one commutator was 500 volts, and only half of the electrical energy sent to the sub-stations was transformed, the other half being used without transformation losses.

With the introduction of longer trains, it became necessary to abandon the incline approach to Stockwell depôt, and this has been replaced by a lift capable of taking one engine or coach at a time. When ascending from the underground sidings to the depôt, the lift traverses a distance of about 50 ft. Only a small part of the tracks in the depôt above ground is electrically equipped for testing purposes and rolling-stock is moved by aid of hydraulic capstans. Except at Stockwell station, where the original hydraulic lifts are still in use, all station lifts are now worked by electric power.

The last extension undertaken by the City and South London Railway was that from Angel to Euston, powers for which were obtained in 1903. Messrs. Walter Scott & Middleton were the contractors and the line was opened on May 12, 1907. There was one intermediate station—"King's Cross and St. Pancras"—and a signal box and emergency exit at Weston Street, situated between Angel and King's Cross. The "summit level" (if such term may be used in connection with underground railways) is at the Angel; thence the line falls at 1 in 242, 30, 100, 277 and 60 to King's Cross, following the descent of Pentonville Hill. Euston terminus consists of the usual island platform and scissors crossover, located in a 30-ft. tunnel. At the further end there is also an engine traversing table. Messrs. Spagnoletti's locking-block system of signalling was adopted. In this system. all starting signals are normally locked and can be unlocked only by the signalman in the advance box.

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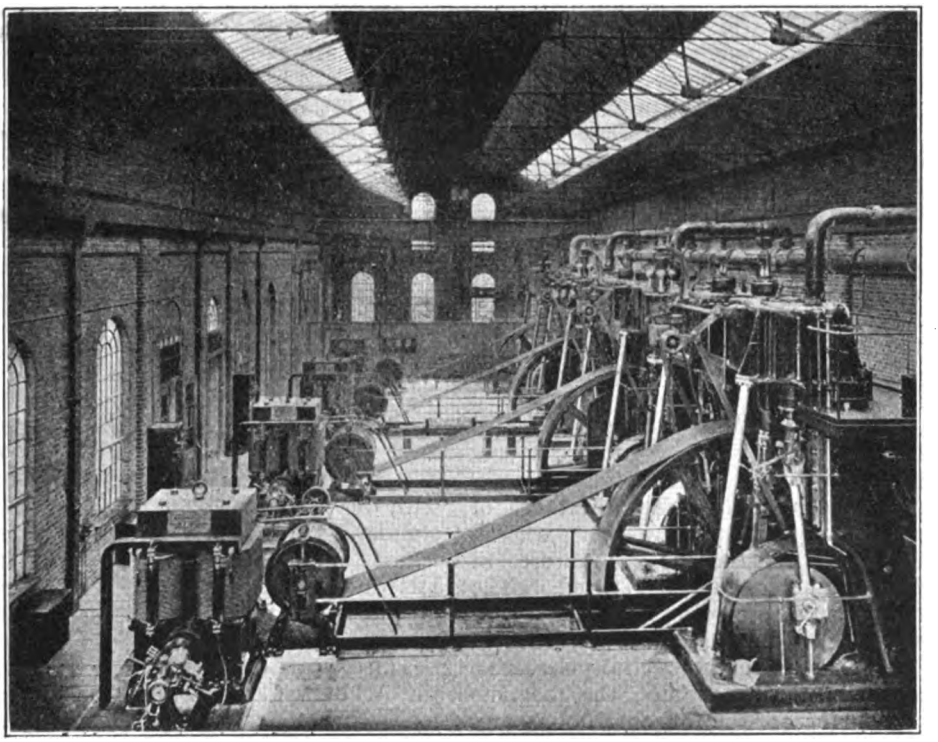
To meet the demand for increased power, additional plant was installed at Stockwell in 1907. This consisted of a Paxman-Lentz engine of compound vertical inverted type, with cylinders 27 in. and 47 in. by 20 in., supplied by Messrs. Davey, Paxman & Co. It was direct coupled to two generators of 400 k.w. each, arranged in tandem on one shaft, and made by the Electric Construction Company.

A noteworthy characteristic of this railway is the employment of separate locomotives for hauling trains—a system



STOCKWELL POWER-HOUSE AS FIRST EQUIPPED.

of working which has been in operation since the line was opened. About the year 1895, motor-coach trains were experimentally used, but showing no superiority over locomotives, they were withdrawn. For the opening of the line, Messrs. Mather & Platt supplied 14 locomotives in 1889. Carried on four wheels and weighing 10 tons 7 cwt., they were capable of running at a speed of 26 m.p.h. The wheels were 2 ft. 3 in. in diameter and the wheelbase was 6 ft. The distinguishing feature was that the armature was mounted directly upon the axle, thus dispensing with intermediate gearing. Two motors were provided (one on each axle) and together they developed 100 h.p. The wheels were, of course, uncoupled. Current was conveyed by three (afterwards two) collecting shoes through an ampère meter to a regulating switch, thence to the magnets and back through the engine frames to the rails, thus completing the circuit. Engines Nos. 1 and 2 were put to work experimentally in February, 1890, and No. 2 was then geared, but the order for geared engines was not repeated. No. 10 hauled the Royal train on November 4, 1890, and in honour of the occasion was named "Princess of Wales," an inscription which it still carries, together with the date "November 4th, 1890." This engine was painted French grey, whereas dark brown was the livery originally adopted for the others.

The Westinghouse continuous brake was fitted, but for some years the compressing pumps were situated at Stock-

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well depôt, and not on the engines. The latter carried only the air reservoirs, which were of sufficient capacity to make 50 stops without being recharged. Now, however, each engine is provided with its own electric air compressor.

In 1891 two further engines, Nos. 15 and 16, were supplied by Messrs. Siemens Brothers & Co. These weighed 13½ tons each. No. 17, constructed at Stockwell works, followed in 1897. With a view to the introduction of a more powerful type, three firms were invited to design an engine each. Under this arrangement, Messrs. Crompton & Co. supplied No. 18, whilst the Electric Construction Company and the Thames Iron Works were responsible for Nos. 19 and 20 respectively; all three being delivered in 1898, though No. 18 was dated 1897. These engines were subjected to severe working tests, and from the results obtained, a specification was prepared and tenders issued for a further number of engines. Messrs. Crompton's tender was accepted and they supplied all future locomotives from their Chelmsford works, viz., Nos. 23 to 32 in 1899; Nos. 33 to 42 in 1900; and Nos. 43 to 52 in 1901. In the meantime, the Company built two more at Stockwell—Nos. 21 and 22, completed in 1900.

In the earlier engines, the magnets were very close to the conductor rail, and to obtain more clearance, those of Crompton's make had larger wheels, 2 ft. 7 in. in diameter. Armatures of greater diameter were also fitted. The two motors were of four-pole, series-wound type, direct coupled, with field magnet coils on the horizontal poles. To facilitate armature repairs, the magnets were split across the diagonal outers and brackets supporting the motor bearings were divided in halves, so that each part of the magnet carried its bracket when the halves were separated. The wheel-base of the Crompton engines was 5 ft. 6 in. and the total weight 13 tons.

Commencing in 1904, reconstruction of the Mather & Platt engines was taken in hand at Stockwell works. Properly speaking, this reconstruction was a renewal, for really the only part left of the original 1889 engine was the cab. In rebuilding, two of the British Thomson Houston Company's geared motors with K6A type controllers were fitted. Engine No. 11 was first supplied experimentally with a pair of G.E. 57 pattern motors and the remainder with G.E. 74 motors. Together, the latter type, developed 160 h.p. Ten of these engines were reconstructed, as under :—

No. 3 in 1905.	No. 8 in 1907.
No. 4 in 1905.	No. 9 in 1907.
No. 5 in 1906.	No. 10 in 1905.
No. 6 in 1906.	No. 11 in 1904.
No. 7 in 1906	No. 12 in 1907.

In 1912 No. 22 was equipped with two No. 211 interpole motors of 120 h.p. each, supplied by the British Thomson-Houston Company. This experiment was made with a view to the re-equipment of the line for an accelerated service.

There are now 44 engines in service: Nos. 2, 13, 14, 15, 16 and 17 having been broken up, whilst Nos. 1 and 20 are withdrawn and kept at Stockwell. It is understood that No. 1 is to be preserved and go to South Kensington Museum as representing the pioneer electric railway locomotive. The engines are painted orange chrome in the form of three panels, with yellow edging and black borders. Underframes are coloured red brown and cab roofs white. Number plates of brass, with raised figures on a vermilion ground, and brass beading round the cab windows contribute much to the smart appearance of the locomotive stock. As City and South London engines are not fitted with the "dead man's handle," which is a standard fitting on other tube railway trains, an assistant driver is carried. His duties, among others, are to couple and uncouple the engine at each terminal station.

Thirty carriages were constructed by the Ashbury Carriage and Iron Company for the opening of the railway. They were bogie vehicles, having end doors and platforms and longitudinal seats for 32 passengers. Height from floor to roof was 7 ft.; extreme width 6 ft. 10 in.; length over body 26 ft. and over bogie frames 32 ft. The wheels were 2 ft. in diameter, and the total weight about 7 tons. When built, the sidelights were very small, but they have since been enlarged. All bogie frames are extended beyond the carriage ends in semi-circular shape. These projections form the buffers, and to them are attached the coupling pins. Buffing strains are therefore taken by the bogies, and not by the carriage frames. On these bogie extensions are fitted the inter-

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mediate platforms. Between 1889 and 1907, 165 coaches were built, as shown hereunder, but five of the earlier ones have been broken up, leaving 160 now in service :—

Numbers.	Builders.	Date.
1 to 30	Ashbury Carriage & Iron Company ..	1889
31 to 36	G. F. Milnes & Co...	1891
37 to 39	Bristol Carriage & Wagon Company	1894
40 to 46	Oldbury Carriage & Wagon Company	1896
47 to 54	G. F. Milnes & Co.	1897
55 to 84	Hurst Nelson & Co.	1899
85 to 108	G. F. Milnes & Co.	1901
109 to 124	Bristol Carriage & Wagon Company	1901
125 to 132	G. F. Milnes & Co.	1902
133 to 165	Brush Electrical Engineering Company	1907

As regards dimensions and general appearance, the various lots differ very little, but those built by the Brush Company are of all-steel construction. They are 32 ft. long, 8 ft. 4¼ in. high from rail level, and 6 ft. 9 in. wide.

In 1913, the City and South London Railway, having come under control of the Underground Electric Railways Company of London, Limited, authority was given to increase the diameter of tunnels to 11 ft. 8½ in., and already some little progress has been made in this direction. Since 1915 power has been supplied from Lots Road generating station instead of from Stockwell. The plant at the latter place (which was the second installation and dated from 1900) has been dismantled and sold, but Stockwell depôt is still open for repairs to engines and carriages, and a sub-station has been placed there. Other sub-stations are now situated at Elephant and Castle, Old Street and Euston (the first- and last-named being jointly owned with the "Bakerloo" and "Hampstead" Railways respectively), and they replace those at London Bridge and Angel. The line is now worked at 550 volts instead of 500, the two-wire system of distribution being in operation, but with more feeding points than formerly, as mentioned above.

At the present time the standard composition of a train is five coaches, and 28 trains an hour are run during times of pressure. This compares with 12 trains (three coach sets) in 1890; 17 in 1893 and 25 (four coach sets) in 1902. The journey from end to end occupies 32 minutes. Under present working conditions, 28 trains an hour is a very good record, for although automatic signals are gradually being fitted, the City and South London is still, for the most part, a manually-signalled railway. It is further to be remembered that engines are changed after each trip, an operation which involves a considerable number of point movements. Trains run for 19 hours out of the 24, viz., from 5 a.m. to 12 midnight. On Sundays the service commences at 8 a.m. and finishes at midnight. Considering the age of the various equipments and the small number of failures that occur, the performance of the trains is remarkably good and is a fitting testimony to the British workmanship of years ago. Spare engines are stabled in the sidings at Euston, Angel, Moorgate Street, Elephant & Castle, Stockwell and Clapham Common. All daily engine and car examinations and light repairs are carried out in the tunnel sidings.

With the name of Mr. J. H. Greathead should be coupled that of Mr. Basil Mott, who was associated with him during construction of the line and became its first chief engineer. He was afterwards—with Mr. David Hay—consulting engineer for the extension works. Mr. Mott was succeeded as chief engineer by Mr. P. V. McMahon, who is now superintendent of power of the Underground Railways. Over a course of years Mr. McMahon repeatedly conducted experiments with the locomotives and current supply in order to obtain the best results, and to him credit is due for the high state of efficiency to which the general equipment was brought.

How this railway has progressed is best shown by the undermentioned particulars of passengers (exclusive of season ticket holders) conveyed at different periods, viz. :—

1891	...	...	...	5,161,398
1899	...	...	...	6,983,040
1906	...	...	...	18,149,413
1914	...	...	...	22,281,698

In the above table, 1891 and 1899 represent respectively the first and last complete years of working of the original system between King William Street and

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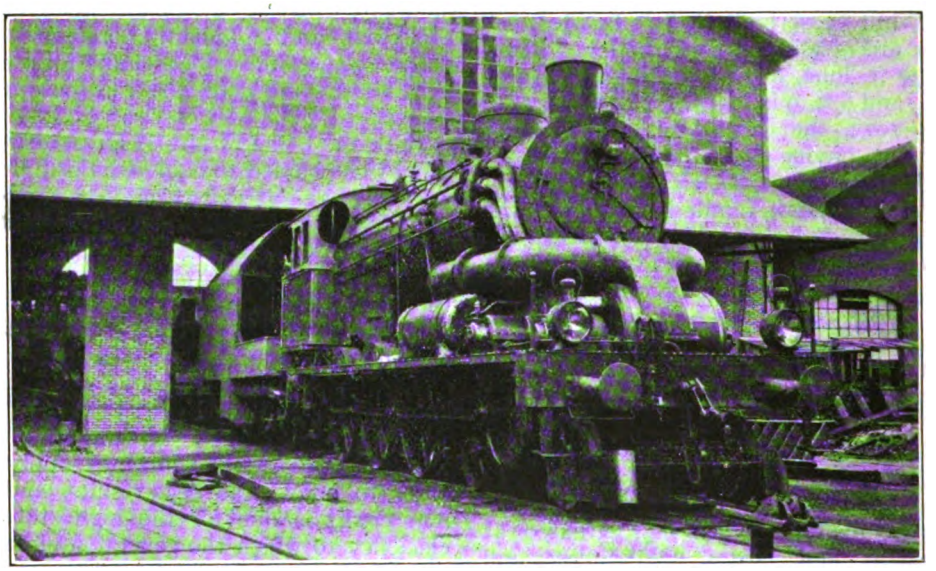
Stockwell. 1906 was the year previous to the opening of the Euston extension. It is not possible to give the numbers of passengers for a later date than 1914, but the approximate total for the period January–June, 1920, was 21⅓ millions. In 1891 six stations and three miles of line were open for traffic; in 1906, 13 stations and six miles; whilst from May, 1907, the respective figures have been 15 and 7¼. A table of distances is appended :—

	M.	C.		M.	C.
Clapham Common	0	0	Bank	4	19
Clapham Road ...	0	32	Moorgate Street	4	60
Stockwell	0	78	Old Street ...	5	16
Oval	1	60	City Road ...	5	64
Kennington ...	2	24	Angel	6	9
Elephant & Castle	2	67	King's Cross ..	6	76
Borough	3	29	Euston	7	28
London Bridge ...	3	61			

To the officials of the "Underground" system of lines the writer tenders his best thanks for their kindness in meeting his requests for information concerning the City & South London Railway.

TURBINE-DRIVEN LOCOMOTIVE: SWISS FEDERAL RAILWAYS.



We are indebted to Mr. G. W. Swallow, of Waedenswil, Switzerland, for the photograph reproduced, showing an experimental locomotive, operated on turbine principles, which is undergoing exhaustive trials on the Swiss Federal Railways. Designed by Mr. Zoelly, of Messrs. Escher, Wyss & Co., Zurich, it has been constructed by the Swiss Locomotive Works, Winterthur, utilising an older engine belonging to the Swiss Federal Railways. The turbine is of reversible type and is placed in front of the smoke-box, power being transmitted by 1 : 30 gearing to a blind axle placed over the bogie and driving the coupled wheels through coupling rods. The engine is designed for a turbine speed of 8,000 r.p.m., giving a running speed of 78 km. per hour.

The boiler is equipped with superheating apparatus. A condenser is fitted below the boiler, utilising water from the tender, to which it is returned for cooling by being allowed to fall in narrow streams from the roof which is designed for the purpose. As there is no blast pipe an air draught through ventilators is used for maintaining the required action on the fire, in conjunction with a blower. It is claimed that in trial trips the engine has shown a fuel economy of 25 per cent., as compared with the compound locomotives in service, while the engine runs very smoothly at high speeds in view of the absence of reciprocating parts. We hope to describe this engine more fully in due course.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN.
A.M.Inst. T.

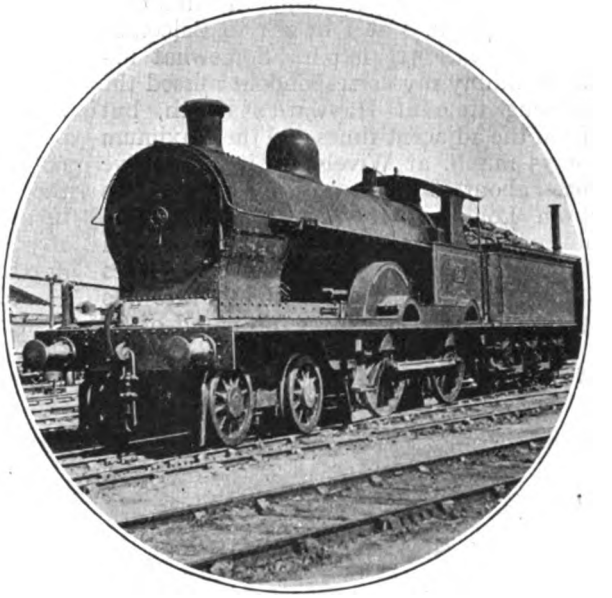

Photo.] [*F. W. Curtis.*

LONDON & NORTH WESTERN RAILWAY.

4-4-0 locomotive, No. 659, "Dreadnought."

THERE were but few alterations worthy of record in the October time-tables. The most praiseworthy acceleration was that of the "Southern Belle" expresses on the London, Brighton and South Coast Railway to their old 60-minute run between Victoria and Brighton, together with the reinstatement of the afternoon trains, at 3.10 p.m. from Victoria, and 5.45 p.m. from Brighton, also making the journey of 50·9 miles in the even hour. I am only sorry that the Brighton journeys which I made recently, and described in the last issue, were not deferred until I could time again on the old schedule, for I realised, while making those journeys, what first-class running is required to maintain such timings with present loads. One is apt to forget that the first 19 miles from Victoria are almost entirely on rising grades, beginning briefly at 1 in 64, and including 6 miles further inclined at from 1 in 94 to 1 in 166; the same length is necessarily run at moderate speeds in the reverse direction owing to curves and suburban complications. The remainder of the route, too, is a series of long banks, even though the ruling grade be not severe. Fortunately a fellow-recorder has come to my rescue with a return log on the speeded-up Brighton service, to which I am very glad to give publicity. The trains concerned were the 11 a.m. from Victoria and the 5.45 p.m. from Brighton, loaded in each case to one third and three first-class "Pullmans," and three ordinary third-class coaches; the tare load was 223 tons, and the gross load, with a full complement of passengers both ways, 240 tons.

On the down journey superheated "Atlantic" No. 422 was the engine. The first mile-post was passed in 3 min. exactly, and Clapham Junction, 2·7 miles, in 5 min. 47 sec., after which speed fell to the distinctly moderate figure of 36½ m.p.h. on the 3 miles at 1 in 166-94 to Balham; Streatham Common, 6·6 miles, was passed in 11 min. 27 sec., and East Croydon, 10·5 miles, in 16 min. 20 sec., with an intermediate maximum of 51½ m.p.h. The rise to Quarry was also taken gently, the minimum on the concluding 1 in 165 being 43 m.p.h.; Quarry Box, 18·9 miles, was passed in precisely 27 min.—2 min. behind time—with 33 min. left for the remaining 32 miles. On the falling grade to Horley a speed of 72½ m.p.h. was reached, the 7·1 miles from Quarry occupying 6 min. 37 sec., and the 3·6 miles on to Three

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Bridges 3 min. 47 sec., while the minimum up the 4⅜ miles at 1 in 264 to Balcombe Summit was 51½ m.p.h. Somewhat unaccountably my correspondent missed the passing time at Hayward's Heath, but from the adjacent times and the maximum of 75 m.p.h. at Wivelsfield it must have been about 46 min. 20 sec. for the 38 miles from London; Keymer Junction, 41·2 miles, was passed in 48 min. 44 sec. On the rise to Clayton Tunnel, which includes 4 miles at 1 in 264, the minimum rate was 51 m.p.h., followed by a top speed of 67 on the subsequent descent, and Brighton was reached in 59 min. 50 sec.

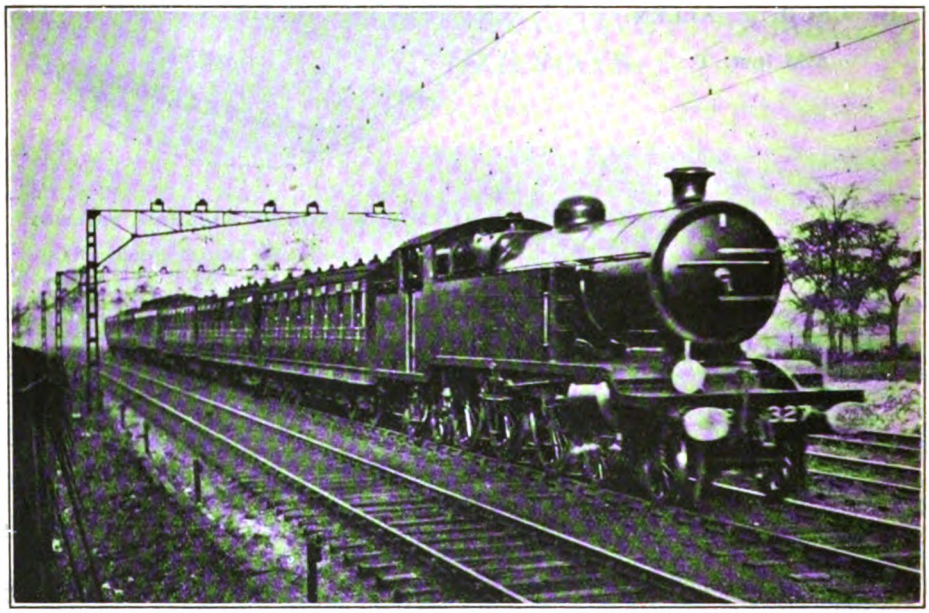

Photo.] LONDON, BRIGHTON & SOUTH COAST RAILWAY. [*F. W. Curtis.*

Victoria–Brighton Pullman-car express. 4-6-4 tank engine, No. 327, "Charles C. Macrae."

Of the two journeys the one in the up direction was much the finer, behind No. 41, a non-superheated "Atlantic." Unfortunately, after the starting time of 3 min. 20 sec. to Preston Park (1·3 miles), details of the running to Clayton tunnel are entirely lacking, and the next time given is at Hayward's Heath, 12·9 miles, passed in 15 min. 31 sec. from the start, speed having risen to 70½ m.p.h. on Hassocks bank. Going up to Balcombe Tunnel (an 8-mile rise, with 6⅜ at 1 n 264) the minimum was 55½ m.p.h., Balcombe Station, 16·8 miles, being passed in 19 min. 29 sec., but signals on at Three Bridges reduced speed to 30 m.p.h., and caused the 21·3 miles to that junction to take 25 min. 4 sec. There was a recovery to 64½ m.p.h. at Horley (24·9 miles, passed in 28 min. 51 sec.), after which a noteworthy ascent was made to Quarry, the 6¾-mile bank, beginning with 4 at 1 in 264, and with the remainder at 1 in 163-200-230, reducing the speed only to 50 m.p.h. So Earlswood, 29 miles, was passed in 33 min. 3 sec.; Quarry Box, 32 miles, in 36 min. 24 sec.; Purley, 37·3 miles, in 41 min. 41 sec. (at 71½ m.p.h.); East Croydon, at reduced speed, 40·4 miles, in 44 min. 28 sec.; and Balham, 46·1 miles, in 50 min. 26 sec. Speed had risen to 64½ m.p.h. at Streatham Common, but severe slacks were experienced all the way from Balham into the terminus, the arrival time being 59 min. 21 sec. after leaving Brighton. But the net time, allowing for both the Three Bridges and the concluding slacks, could not have exceeded 56 min. at most; it was probably nearer 55 min. This was a first-class performance.

The best of all the winter time-tables is probably the Great Western. It includes

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the bulk of the summer expresses, the 12 noon non-stop to Torquay and the return non-stop from Newton Abbot due in London at 4.5 p.m. being, in particular, very good winter " fare." In view of the retention of the 11 a.m. from Paddington, which still calls first at Exeter, but now terminates at Falmouth and Newquay instead of Penzance, the Exeter slip on the down " Riviera " is at last withdrawn. But the slip portions for Westbury and Taunton reappear on this train. The only important West of England facilities to be cut out are the 4 p.m. from Paddington to Plymouth and the 1.30 p.m. from Penzance to London, in both cases *via* Westbury; in regard to the former the 4.10 p.m. to Bristol is put forward to 4 p.m., and resumes its old Plymouth working by the Bristol route. In other directions the most important change is the resumption of non-stop running from Paddington to Newport by the midday express (now starting at 11·50 a.m.), which makes the run in 157 min., or 4 min. over the pre-war time; and in the opposite direction by the morning train from Neyland, which makes the Newport-London run in 160 min. Through services are retained between Torquay and Liverpool, Manchester, Sheffield, Leeds and Bradford, also between Swansea and Newcastle and London and the Cambrian Coast. The only blot on the Great Western time-table, indeed, is the continued slowness of the Birmingham trains, which, while conforming to the standard adopted by both companies concerned for the London-Birmingham journey, is altogether inconsistent with the excellent speeds now run by Great Western expresses in all other directions. Worcester, for example, though 10 miles further from Paddington than Birmingham, is actually reached in 15 min. less!

Another notable winter time-table is that of the Midland Company, which carries further the general speeding-up and amplification of service that has characterised all recent issues. The most remarkable acceleration is that of the 7.20 a.m. train from St. Pancras to Manchester, which, while carrying an additional Yorkshire portion as far as Nottingham (as it did in pre-war days), now leaves at 8.15 a.m., and arrives at Central Station at 1.5 p.m., only 5 min. later than before. Stops south of Kettering, except Luton, are cut out, and made by a new semi-fast at 7.55 a.m. to Nottingham *via* Leicester; despite that, the 8.15 a.m., with stops at Luton, Kettering, Oakham, Melton, Nottingham, Derby, Matlock and Chinley—eight in all—11 miles extra distance to run and an additional slack, at Trent, only takes 20 min. more on the journey to Manchester than the best trains *via* Leicester, some with two or three stops only. Slight alterations to the departure times of other trains now give the Midland a " two-hourly " service from London to Manchester—at 8.15 and 10.15 a.m., 12.15, 2.15, 4.15 and 6.15 p.m. Other alterations relate mainly to the Sheffield, Leeds and Bradford service. An entirely new train leaves St. Pancras at 5 p.m., calling first at Nottingham in 145 min.—1 min. less than the previous best; the 4.25 p.m. down (now 4.23) serves Kettering, Oakham, Melton and Nottingham only. The 10.20 a.m. down (now 10.40) is expedited 20 min. to Sheffield, and the 5.35 p.m., 15 min. to Leeds; the 10.48 a.m. from Leeds is quickened 15 min. south of Nottingham, and the 12.52 p.m. from Leeds (now 1.8) is cut by 21 min. to London. A new express leaves Sheffield at 3.20 p.m. for Nottingham, taking up there the working to London of the cancelled Edinburgh express due at 7 p.m., while another new express from Sheffield at 5 p.m. to St. Pancras (due 8.45 p.m.) *via* Nottingham replaces the withdrawn 5.8 p.m. semi-fast from Leeds. It is clear that competition is as yet by no means dead, as the careful time-table student will notice that almost every Great Central express is now duplicated throughout its journey by a Midland train at very similar—in some cases exactly so—travelling times.

There is but little to say about other companies' changes. The South Eastern & Chatham Railway has a general speeding-up of services for the winter, restoring them to the times generally in force before the summer alterations, all the Folkestone non-stops, for example, reverting to the 90-min. schedule, while Margate now has a 92-min. train each way, and four others in from 95 to 98 min. The Great Eastern Railway also restores the winter service of last year, with its distinctly faster running times, such as 86 min. from Ipswich to Liverpool Street by the 8.3 p.m.

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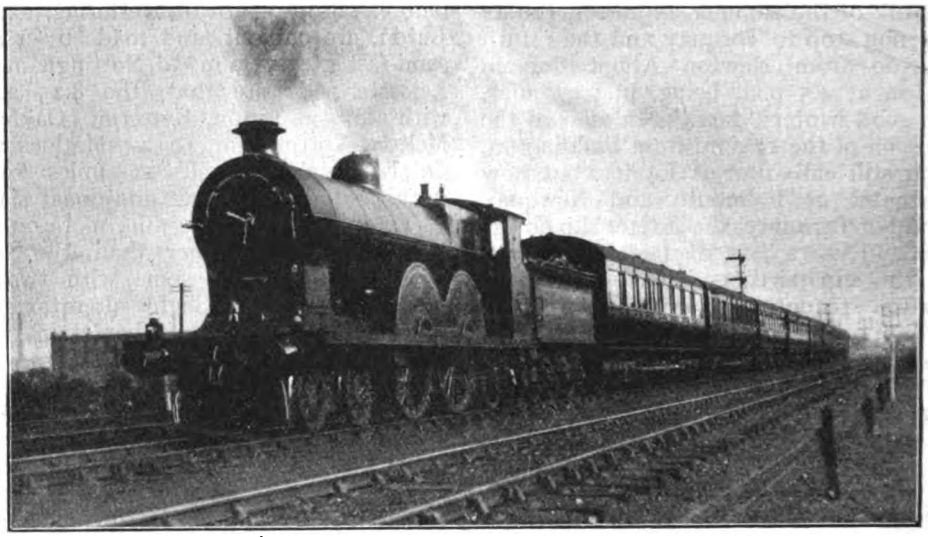

Photo.] LANCASHIRE & YORKSHIRE RAILWAY. [*G. W. Smith.*

Manchester–Newcastle restaurant-car express near Middleton Junction. 4-4-2 locomotive, No. 737.

express. Principal additions in the latter case are a Saturday service at 1.30 p.m. from Liverpool Street to Clacton and Walton, non-stop to Thorpe, and a restaurant car service between Harwich and York. The Harwich–York working is of a good "semi-fast" character throughout, but the south-bound train calls at practically every station after Ely, and waits at Ipswich 34 min.

On the North Eastern Railway the 8.55 a.m. express from Leeds to Glasgow at last becomes a corridor luncheon car express again, the car being attached at Newcastle. An unintentional piece of humour on the part of the authorities is that of describing this train on the Newcastle–Edinburgh time-sheets as "Sleeping Car Express, Newcastle to Glasgow"! It is disappointing to find that the useful return express from Edinburgh to the South at 6.25 p.m. has not been reinstated; the restaurant car returns from Glasgow to Edinburgh on the 4.55 p.m. train, waits at Waverley for 51 min., and proceeds thence to Newcastle as a "diner" on the 7 p.m. East Coast train.

Coming now to performance, I must first shed the light of publicity on some exceedingly fine Great Northern trips, of real pre-war merit. First comes a journey on the 5.30 p.m. down Newcastle express from King's Cross, made up on this occasion to nine bogie vehicles, and weighing 259 tons tare and 275 tons gross. Superheater 4–4–2 No. 1416 was the engine, driven by J. Baines. The start was moderate in character, our time to Finsbury Park, 2·5 miles, being 7 min. 20 sec.; to Potter's Bar, 12·7 miles, 21½ min.; to Hatfield, 17·7 miles, 26 min. 50 sec.; to Knebworth, 25 miles, 35 min. 25 sec.; and to Hitchin, 31·9 miles, 42 min. 25 sec. But after that we did some very fast running, not quite reaching 80 m.p.h., but sustaining 79 for some distance near Three Counties, only falling to 72½ beyond Arlesey, reaching 77½ again at Biggleswade, and maintaining a minimum of as much as 62½ m.p.h. over St. Neot's "hump"; subsequently the engine was eased, and we only reached 67 at Offord, and fell to 36½ m.p.h. on Stukeley bank. But we had covered the 12·2 miles from Hitchin to Sandy in 9 min. 50 sec., the 7·6 miles thence to St. Neot's in 6 min. 40 sec., and the 7·2 miles on to Huntingdon in 6 min. 55 sec., total 23 min. 25 sec. from Hitchin, or 26½ min. from Stevenage, the last-mentioned 30·3 miles having been covered at an average speed of 68·6 m.p.h. The "easing" beyond Huntingdon, which we passed over 7 min. early, resulted in a time of 6 min. 25 sec. for the 4·6 miles on to Abbots Ripton, and a subsequent maximum of 74 m.p.h.

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on Ripton bank was cut short by a very bad signal check at Holme—evidently from the 5 p.m. *ex*-King's Cross, which we passed at Peterborough, 88 min. 10 sec. after leaving London.

Slacking at Peterborough with unusual caution to 19 m.p.h., we picked up speed so well as to be doing 62½ m.p.h. at Werrington, 65 at Tallington and 66 between there and Essendine, the 3·1 miles of recovering speed from Peterborough to Werrington taking 5 min. 20 sec., and the 9·1 miles thence to Essendine 8 min. 50 sec. Grades are almost exclusively rising from Werrington, even if slight at first, but they steepen to 1 in 264 for 1¾ miles to Essendine, ¾-mile at 1 in 240 beyond, 1¼ miles at 1 in 200 to Little Bytham (where we were still doing 60 m.p.h.) and another 3½ miles beyond Bytham at the same inclination, which reduced our speed to 52 m.p.h. Again the engine was slightly eased, and on the last 3 miles at 1 in 178 to Stoke Box we fell to 44 m.p.h. But if the time of 3¾ min. from Corby to Stoke was not exceptional, that of 5 min. 25 sec. for the 4·9 miles from Bytham to Corby certainly was, as it gave us an average of almost exactly 60 m.p.h. from Werrington to Corby—17·6 miles with a clear difference in level of 210 ft., and an average up-grade, therefore, of 1 in 344. So the 23·7 miles from Peterborough to Stoke took 26¾ min., and despite signal delays outside Grantham we stopped there in 121 min. 50 sec. from London, or 117¾ min. net. Allowing for normal running over the stretches where the engine was materially eased—Hatfield-Hitchin and Huntingdon-Ripton—and also for the exceptional slack through Peterborough, we might have passed Hitchin in 41½ min. Huntingdon in 64¾ min., Peterborough in 82¾ min., and reached Grantham in 115 min., 9 min. under the present schedule, and 2 min. under the pre-war schedule, with a heavier than pre-war load.

Fitting sequels were two trips on the same train behind the pioneer large-boilered "Atlantic," No. 251, splendidly handled by B. Codd on the first run, and Bartlett on the second. The engine is now superheated. A normal 8-coach load of 245 tons gross was taken on both runs, and on each occasion we were only a minute late away from Grantham. Principal interest in the first run attaches to a time of exactly 34 min. for the 33·1 miles from Grantham to Retford; twice attaining 71½ m.p.h. before Newark, we

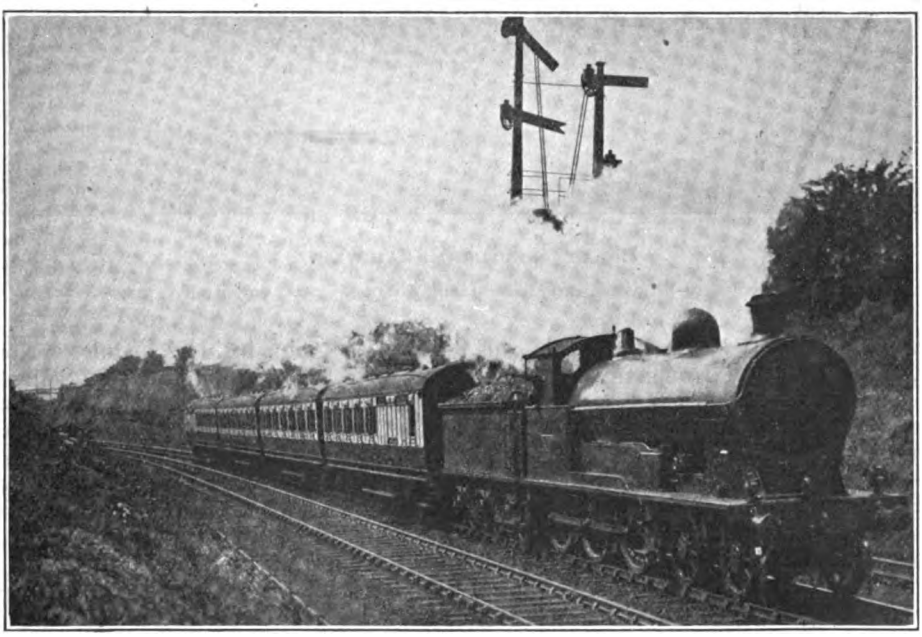

Photo.] LONDON & NORTH WESTERN RAILWAY. [*F. E. Mackay.*

Carlisle Express near Penrith. Superheater 4-6-0 locomotive, No. 863.

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passed Hougham, 6 miles, in 8 min. 20 sec.; Newark, 14·6 miles, in 15¾ min.; Crow Park, 21·9 miles, in 22½ min.; and Markham Summit, 28·2 miles, in 29 min. 10 sec., the lowest speed on the 6¼-mile ascent (3¼ miles at 1 in 200) being 52½ m.p.h., while the maximum was 68 before Retford. After Retford there was no further running of note, Doncaster, 50·5 miles, being passed in 53 min. 5 sec., and Selby, 68·9 miles, in 75 min. 25 sec. (3½ min. under schedule); there were bad signal checks from Naburn to York, but we reached Clifton Junction, 83 miles, in 97 min. 25 sec., or 95½ min. net, against a schedule of 99 min.

52 at Piper's Wood summit; Ranskill, 38·4 miles, was passed in 40 min. and Bawtry, 42·2 miles, in 43 min. 35 sec., while we were through Doncaster—after very leisurely running from Rossington—in 52 min. 20 sec. Again we picked up well, passing Shaftholme Junction, 54·7 miles, in 57 min. 5 sec., and Templehirst, 64·3 miles, in 67 min., but from there to York the easiest possible running ensued, as we were now well before time. Selby was passed in 73 min. 35 sec. (a gain of 5½ min.), the centre of York Station in 93 min. 20 sec. (the pre-war time from Grantham to York was 94 min.) and Clifton was reached in 94 min. 50 sec.,

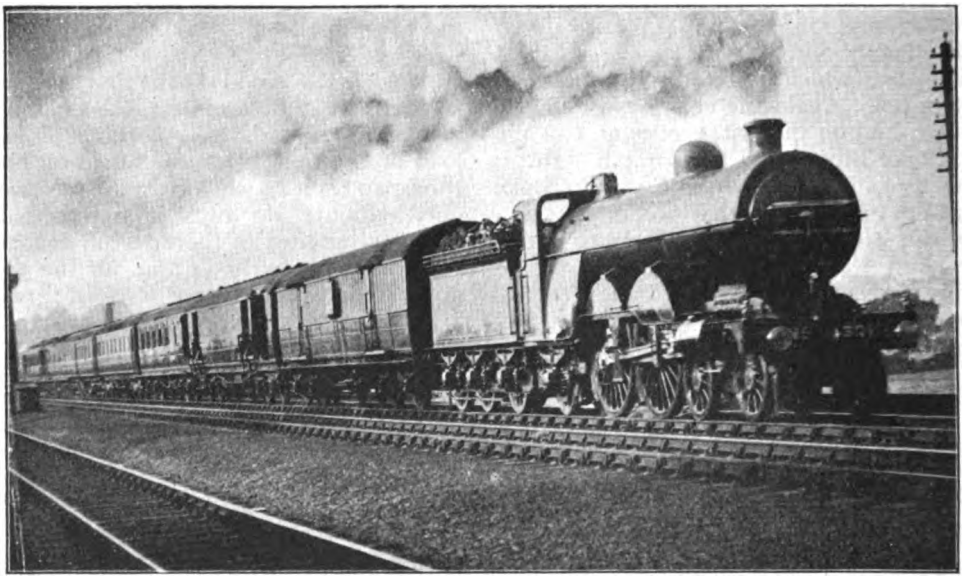

Photo.] GREAT NORTHERN RAILWAY. [*C. Laundy.*

King's Cross–Leeds mail train near Hadley Wood. 4-4-2 engine, No. 301.

A lightning start began the second run, as we were through Hougham in 8 min. 5 sec., Newark in 15½ min., and Crow Park, 21·9 miles, in 22 min. 10 sec.—nearly "even time"—having reached a top speed of 74 m.p.h. before Claypole. But the engine was eased up to Markham, passed in 29½ min., as the speed fell to 47½ m.p.h., and also down to Retford, to which point our time was 34 min. 40 sec. Speed was reduced to 54 m.p.h. through Retford, and then rapidly picked up to a maximum of 64½ at Ranskill and 66 at Scrooby, with a subsequent minimum of nearly 4¼ min. inside schedule. Normal running from Templehirst to Selby and schedule running thence to Clifton, together with the times of the previous run from Crow Park to Sutton and an average time from Piper's Wood to Doncaster, would have made the time 51 min. to Doncaster, 71¼ min. to Selby, about 90 min. to the centre of York Station and 91 min. to Clifton—a very enterprising effort.

Onwards to Darlington the North Eastern drivers lately have been putting up some good running, as, indeed, is

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necessary on a schedule of 47 min. for the 43·8 miles, with a finish which is now on the average a full minute slower than that of pre-war days. Two runs in particular, made by Driver Gothard on three-cylinder superheated "Atlantic" No. 2208, deserve appreciative mention. On the first we had the nine-coach train of 275 tons, and from Clifton Junction passed Beningbrough, 5·2 miles, in 8 min. 10 sec.; Alne, 10·9 miles, in 13 min. 40 sec.; Pilmoor, 15·8 miles, in 18¼ min.; Thirsk, 21·9 miles, in 23 min. 55 sec.; Northallerton, 29·7 miles, in 31 min. 10 sec.; Eryholme, 38·6 miles, in 39 min. 40 sec.; and Croft Spa, 41·2 miles, in 42 min. exactly. Signal checks ensued, leaving us a net time of 46 min. to Darlington; an old-time finish would have brought us to rest in very little over the pre-war time of 45 min. from York Station. Speeds were 60 m.p.h. at Beningbrough, 66 at Alne, 64½ at Pilmoor, 67 at Thirsk, 64 at Northallerton, 69 beyond Danby, 60 at Eryholme, and 69 at Croft; the 36 miles from Beningbrough to Croft were run in 33 min. 50 sec., at 63·6 m.p.h. average. Though, generally speaking, level, the road is very slightly against the engine almost throughout, and includes two distinct rises—6½ miles at 1 in 627 to Northallerton, and 4 miles at 1 in 696 to Eryholme. The second run, with a 245-ton train, began in rather a sleepy fashion, as we took 8½ min. to Beningbrough, 14 min. 10 sec. to Alne, and 18 min. 55 sec. to Pilmoor, but then we woke up thoroughly, reaching 70½ m.p.h. on the level at Thirsk, and were maintaining a steady 68 on the subsequent adversely inclined length, when most unfortunately we were badly checked by signal at Langlands Junction. We had passed Thirsk in 24 min. 25 sec., and had run the 13·2 miles from Raskelf to Otterington in 11 min. 55 sec., at 66·5 m.p.h. average. From Northallerton, passed in 31 min. 50 sec., we picked up well to 67 m.p.h. beyond Danby, and only fell to 64 at Eryholme, which was breasted in 40 min. 35 sec.; despite a slight signal check outside Darlington, we stopped in 47¼ min., or 46 min. net. The best times from these two fine runs give an aggregate of 41½ min. to Croft, and are thus practically equal to the pre-war running on the 45 min. schedule.

Next I come to a couple of up Great Northern journeys south of Grantham, of really superlative merit. First there was one on the advance portion of the up day "Scotsman," made up to 54 axles, and weighing empty 345 tons, and full 370 tons, behind the tender of superheated 4-4-2 No. 301. We climbed the 5·4 miles of 1 in 200 to Stoke in 11¾ min., and did some good speed on the long succeeding descent, with a maximum of 77½ m.p.h.; Stoke to Essendine, 11·5 miles, took 10 min. 40 sec., Essendine to Werrington, 9·3 miles, 8 min. 10 sec., and Werrington to Peterborough, 3 min. 40 sec.—total 34¼ min. for the 29·1 miles from Grantham. Through Peterborough we reduced speed to 20 m.p.h. On the level stretch past Holme we attained 64 m.p.h., and then went up the 4½ miles at 1 in 200 of Ripton bank without falling below 47½—a fine feat. So the 7 miles from Peterborough to Holme were run in 9 min. 20 sec., the 5·9 miles thence to Ripton in 6 min. 5 sec., and the 4·6 miles on to Huntingdon, which we passed at 69 m.p.h., in 5 min. 5 sec.—total 20½ min. from Peterborough. Over St. Neot's "hump" speed fell to 53½ m.p.h., recovering to 60 at Tempsford, where the engine was blowing off freely; the 7·2 miles from Huntingdon to St. Neot's took 6 min. 55 sec., the 7·6 miles thence to Sandy 8 min., the 7·1 miles on to Arlesey 8 min. 10 sec., and the 5·2 miles up to Hitchin 6 min. 25 sec. —total 29½ min. for the 27 miles from Huntingdon. On the long ascent to Stevenage speed fell to 37 m.p.h., the 6·9 miles from Hitchin to Knebworth taking 9 min. 55 sec., but then followed a remarkable exhibition of speed. Touching 75 m.p.h. at Hatfield, we actually went up to Potter's Bar at a minimum of 56½, the time of 4 min. 50 sec. for the 5 miles between these points being quite my record with such a load; the 7·3 miles from Knebworth to Hatfield took 7 min. 20 sec. We touched 74 m.p.h. before New Southgate, and then slacked to 50 for Wood Green tunnel, the 10·2 miles from Potter's Bar to Finsbury Park taking 10 min. 20 sec.; bad signal checks caused the remaining length into the terminus to occupy 5 min. 25 sec. Nevertheless, our total time from Grantham to London was 122 min. 5 sec. for the 105·5 miles, no less than 10 min. clear inside schedule (we were 21½ min. late away); net time was 119½ min., which is 2½ min. less than the pre-war time with a far

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greater than pre-war load. The 92·1 miles from Corby to Wood Green, including Peterborough slack to 20 m.p.h., were covered in 98 min. 35 sec., at an average rate of exactly 56 m.p.h.—a really notable achievement. Gardiner was the driver.

A further run of great merit was one made behind superheated "Atlantic" No. 1412 on the 5.30 p.m. from Leeds to London, south of Peterborough, on a night when a special dining-car portion from Hull had been attached to the train, and made it up to one of 58 axles, weighing 432 tons empty, and 450 tons with passengers and luggage, behind the tender. No 273 had lost small amounts of time from Doncaster, giving us a late start of 5 min. from Peterborough, which Driver Parker immediately set out to retrieve. We passed Holme in 11½ min., at 57½ m.p.h., and compassed the next length to Ripton in 6¾ min., speed not falling below 43 m.p.h. Exceptional running ensued, with a top speed of 70½ m.p.h. at both Huntingdon and Offord, and a minimum as high as 57½ at St. Neot's; Ripton-Huntingdon took 5¼ min., Huntingdon-St. Neot's 6 min. 40 sec., St. Neot's-Sandy 7¾ min., Sandy-Arlesey 8 min., and Arlesey-Hitchin 6 min. 5 sec This made the remarkable total of 52 min. exactly from Peterborough, 44·5 miles, scheduled 54 min., and 28½ min. from Huntingdon, 27 miles partly uphill, with a 450-ton train! Minimum rate at Stevenage was 34½ m.p.h., Hitchin-Knebworth taking 10½ min., but from Woolmer Green onwards we ran into a terrible series of signal checks, which quite ruined the conclusion of the run. Otherwise, on this "form," I am quite sure that we should have passed Hatfield in 70 min., and reached the terminus in 90—a notable piece of work.

Photo.] **GREAT NORTH OF SCOTLAND RAILWAY.** [*E. A. Gurney Smith.*

Ballater train leaving Banchory. 4–4–0 locomotive No. 35.

And now, in conclusion, for one or two Great Eastern trips. Some very fair running was made by 4-6-0 No. 1524 on the 12.30 p.m. down Colchester line express, on its winter timing, with a load of 14 crowded bogie vehicles, weighing full 400 tons. Bad p.w.r. checks at Coborn Road and Ilford caused us to take 23 min. 20 sec. out to Romford, 12·4 miles, and 36 min. to Shenfield, 20·2 miles, the lowest speed on Brentwood Bank being 26½ m.p.h. But after Shenfield we went well, covering the 9·5 miles on to Chelmsford in 9¾ min., with a maximum of 62½ m.p.h.; the 8·9 miles on to Witham,

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after a slight slack at Chelmsford, also in 9¾ min., with a top speed of 64½ m.p.h. at the latter place; the 8 miles from Witham to Mark's Tey in 8 min. 50 sec.; and the last 5·1 miles to Colchester stop in 5½ min., with a maximum of 67 m.p.h. at Lexden. By reeling off the 31·5 miles from Shenfield to Colchester in 33 min. 50 sec. we regained over 2 min., the total time from London being 69 min. 50 sec., and the net time about the 66 min. allowed. Delays beyond Colchester spoiled the rest of the run.

A load of 13 corridor 8-wheelers on the 2.10 p.m. express from Norwich to Ipswich had no terrors for superheated "Claud Hamilton" 4-4-0 No. 1845, even though it scaled 343 tons empty and 360 tons full. We got through Trowse and up the 1 in 84 to the Upper Junction, 2·2 miles, in 5 min. 40 sec., and although the next 6·1 miles to Flordon are mainly on rising grades, and include 1½ miles at 1 in 132-143, we covered them in 8 min. 40 sec. Down Flordon "dip" we touched 62½ m.p.h., and the succeeding 6·2 miles to Tivetshall, including 2 miles up at 1 in 136 and ½ at 174, were tackled in the fine time of 6 min. 40 sec., without the speed falling below 51 m.p.h. The engine was now eased somewhat, and speed did not rise above 67 m.p.h. on Burston Bank, while the 10 miles of rising grades to mile-post 85½, including 1½ at 1 in 132 and 2 at 248, brought us down to 45½ m.p.h. So the 5·5 miles from Tivetshall to Diss were run in 5½ min., and the 8·4 miles thence to Finningham in 9 min. 50 sec.; but a slight signal check at Haughley (32·1 miles, passed in 41 min. 10 sec.) heralded a whole series of them from there to Ipswich. Otherwise we should have passed Stowmarket in 43 min., and reached Ipswich with ease in 57 or less, instead of the 61 then allowed. Present schedule is 58 min.

On the Cambridge line I timed some very smart running the other day between Ely and Cambridge behind one of the 5 ft. 8 in. 2-4-0 "mixed traffics," No. 503, which despite such small wheels reached a speed of no less than 61½ m.p.h. on this level course, with a train of six corridor bogies, of 170 tons full weight. Waterbeach, 9·4 miles, was passed in 12 min. from Ely, and Cambridge, 14·7 miles, reached in 18 min. 40 sec., with the usual slow approach. Twenty minutes are allowed. From Cambridge we had 4-6-0 No. 1529, and a nine-coach load of 255 tons, and again ran well. Although there is a practically unbroken rise to Audley End, with 4¼ miles at 1 in 257-336 between Shelford and Great Chesterford, and 2½ thence at 135-160 to Littlebury, we passed Shelford, 3·3 miles, in 6 min., Chesterford, 10 miles, in 14 min. 5 sec., and reached Audley End, 14 miles, in 19 min. 25 sec., 1½ min. inside time. From Audley End there is a falling or easy start of 1·8 miles to Newport, which we covered in 3 min. 20 sec., and then 4·3 miles of further ascent to Elsenham, including 2 at 1 in 180, and the rest at 1 in 276-322, which occupied 5 min. 35 sec.; Bishop's Stortford, 11·3 miles, was reached in 14 min. 40 sec., with a maximum of 67 m.p.h. at Stansted. Allowance from Audley End is 16 min. Away from Stortford, too, we made an excellent start, reaching 65 m.p.h. at Burnt Mill, but easing beyond Broxbourne; we passed Harlow, 5·9 miles, in 8 min. 10 sec.; Broxbourne, 13·3 miles, in 15 min. 20 sec.; Waltham, 17·6 miles, in 19 min. 50 sec.; Ponder's End. 20·6 miles, in 22 min. 55 sec.; and Tottenham, 24·4 miles, in 27 min. exactly, after which came suburban delays. Such running as that recorded on this trip, with a gain of 5¼ min. to engines between Ely and Tottenham, is quite equal for smartness on a semi-fast schedule to that performed anywhere else in the country.

Much harder work was required on two trains timed by correspondents over the same route. On the 1 p.m. from Cambridge, 4-6-0 No. 1529 figures again, with a load of 14 corridor "eights" and a "six," having a gross weight of 410 tons, while on the 7.6 p.m. up No. 1520 had to tackle no less than 15 "eights" and a "six," packed to repletion with holiday passengers, and weighing fully 450 tons. Out of Cambridge the times on the former run were 6 min. 34 sec. to Shelford, 15 min. 33 sec. to Chesterford, 22 min. 15 sec. to Audley End, 24 min. 22 sec. to Newport, 30 min. 5 sec. to Elsenham, and 35 min. 43 sec. to Stortford, 36 min allowed. Minima were 32 m.p.h. at Littlebury and 41 at Elsenham. Much less detail is given in the second log, which states that the 6·7 miles to mile-post 49 were covered in 11 min.

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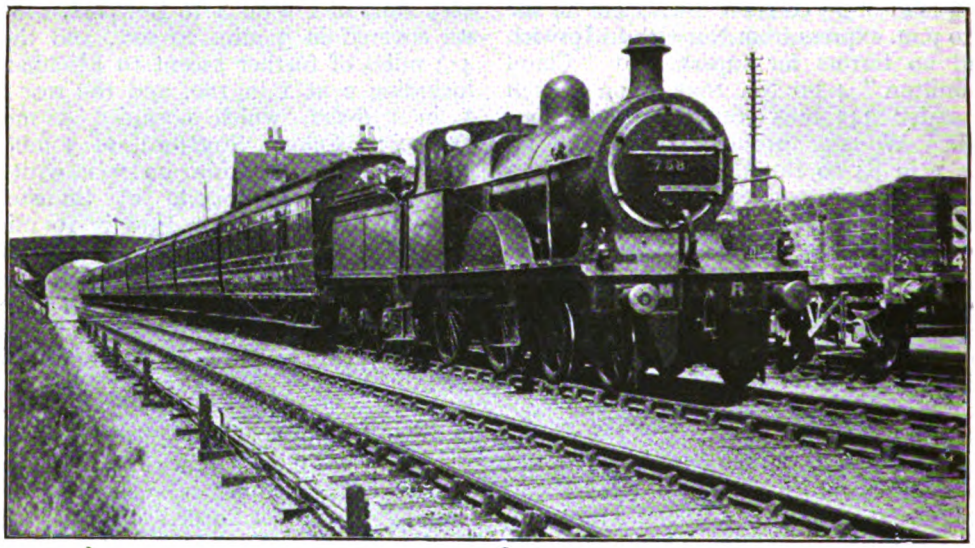
10 sec., subsequent times being 22 min. 25 sec. to Audley End, 31½ min. to Elsenham, and 38 min. exactly to Stortford, with minima of 37½ m.p.h. at Littlebury and 34 at Elsenham. This train is allowed 37 min. to Stortford. From the last-mentioned town No. 1529 passed Harlow in 9 min. 38 sec.; Broxbourne in 16 min. 49 sec. (with a maximum of 64 m.p.h. at Roydon); Waltham in 20 min. 53 sec.; Ponder's End (where there was a slight check) in 23 min. 55 sec.; and Tottenham in 28 min. 39 sec. Liverpool Street, 30·4 miles, was reached in 39 min. 49 sec., although the train is allowed 41 min., after the usual slow running in the suburban area, but, for a wonder, no signal checks. No. 1520, however, after covering the 10·4 miles from Stortford to post 20 in 14 min. 20 sec., was badly delayed by signals all the way to town.

A correspondent writes to point out a remarkable series of errors—reprehensible indeed on the part of so constant an advocate of accuracy as myself!—which somehow or other crept into my October article. In the Great Western Railway run on page 234, the time to Southall (correctly stated later) should be 14 min. 5 (not 40) sec, and to Maidenhead 27 (not 26) min. 40 sec.; to Reading the net time was 35½ and not 36½ min. Further, on page 236, the 5.0 (not 4·3) miles from Whiteball to Tiverton Junction took 5 min. 10 sec. (not 4 min. 40 sec.), and the 7·7 (not 8·4) miles thence to Silverton 7 min. 35 sec. (not 8 min. 5 sec.). I hasten, with regrets, to make these corrections. Another correspondent wishes to correct my Great Western Railway table of speeds, by pointing out that a 40-min. run is made from Reading to Paddington by the 10 a.m. train, which should thus be shown as the fastest journey; in this case I am correct, however, as the working time of arrival in London is 10.42 a.m. by the train in question.



MIDLAND RAILWAY.

Manchester–London express passing Great Glen. 4-4-0 locomotive, No. 758.

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Three-Position Signalling on the Ealing and Shepherd's Bush Railway.

THREE-POSITION signalling is finding its place slowly but surely in British railway practice, and there is no doubt that as time goes on it will become a recognised feature, if not a standard, wherever power equipment is installed. Hitherto, however, it has always been applied sectionally, as on the Keadby deviation of the Great Central Railway, and at Victoria Station, South Eastern and Chatham Railway, or for isolated signals, for example, that outside Paddington station, Great Western Railway. In the case of the Ealing and Shepherd's Bush Railway, however, fully described in the July RAILWAY MAGAZINE and referred to again in the September issue, following the opening for traffic on August 4, the signalling is three-position throughout, so that this is the first example of a line completely equipped on this basis. At the time of our first article the signals had not been installed, and in the second only brief reference was made to its principal characteristics. As there are several special features, in addition to the fact that the signalling is three-position, further description on this ground is now justified. There is no need to repeat information already given in regard to the line itself, and it will be sufficient to mention the respective signal cabins and their application, before dealing with the signals themselves.

Wood Lane Station box is a new cabin containing 21 working levers, and as it deals with the traffic of the Central London Railway proper, is equipped with electro-pneumatic signal and point mechanism. It governs the junctions leading to the new line. Wood Lane Junction box operates the connections with the West London Railway. This line is also served by Viaduct Junction box, where it joins the West London, but this is of ordinary type, while ordinary signals control access to the main line of the Ealing and Shepherd's Bush Railway. Points at Wood Lane Junction box (now known as Box J) towards the West London line are mechanically operated, while those in the trailing direction are of spring type, normally set for the West London line, and run through by the electric trains. North Acton box (K) has a mechanical frame to serve the points and signals connecting with the High Wycombe line, which is here alongside. At Ealing Broadway signals on the new line are controlled by the District Railway cabin, which has been extended, in conjunction with the Great Western Railway main line box, for through working. When the points leading to the Great Western are to be opened, the District Railway signalman pulls No. 15 lever to ask for co-operation; the Great Western man, if he agrees, works the points and takes off the slot on the signal concerned. When the Great Western man wants to send a train on to the new line he asks for permission, and this is given by the District man pulling No. 14 lever.

The District box is provided with an additional electro-pneumatic frame containing five point levers, eight signal levers and three spaces. A siding between the new up line and the District Railway yard, provided for emergency purposes, is worked from the new locking frame and controlled by the frame working the District Railway connections and signals.

At Wood Lane Station box the points are operated electro-pneumatically, at Wood Lane Junction and Acton North they are mechanical, and at Ealing Broadway operation is electro-pneumatic. At Wood Lane Junction there is no locking bar on the facing points, as the facing point lock lever is held by a track circuit 400 yards in length, commencing at the inner up home signals, and extending to just beyond the fouling point on both lines in advance of the junction. At North Acton signal-box the crossover junction was brought into use some time ago when goods trains commenced running over the new line to get to the West London Railway by this alternative route. The facing points in the down line were then provided with the customary equipment, including a locking bar. At Ealing Broadway the usual electro-pneumatic

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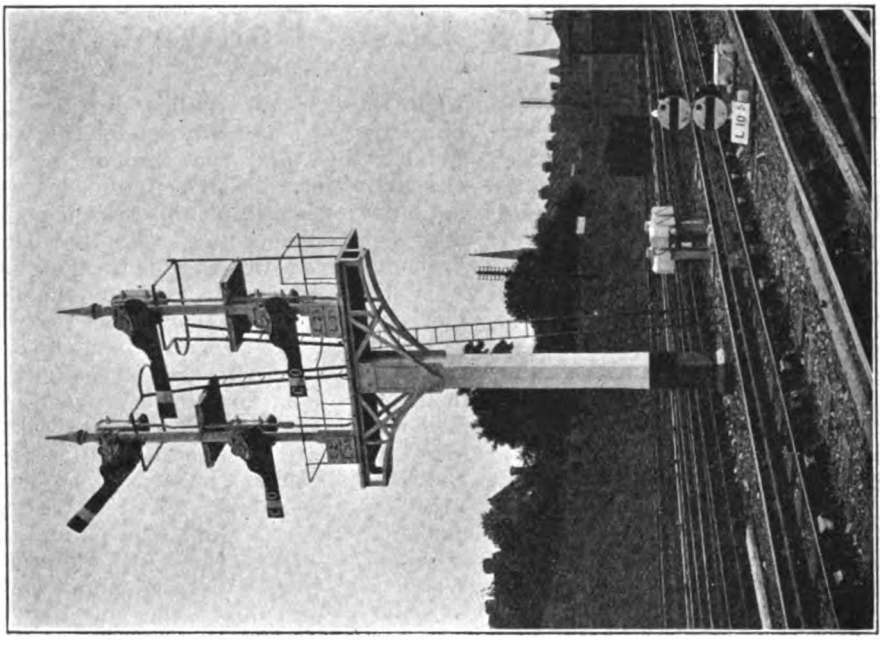
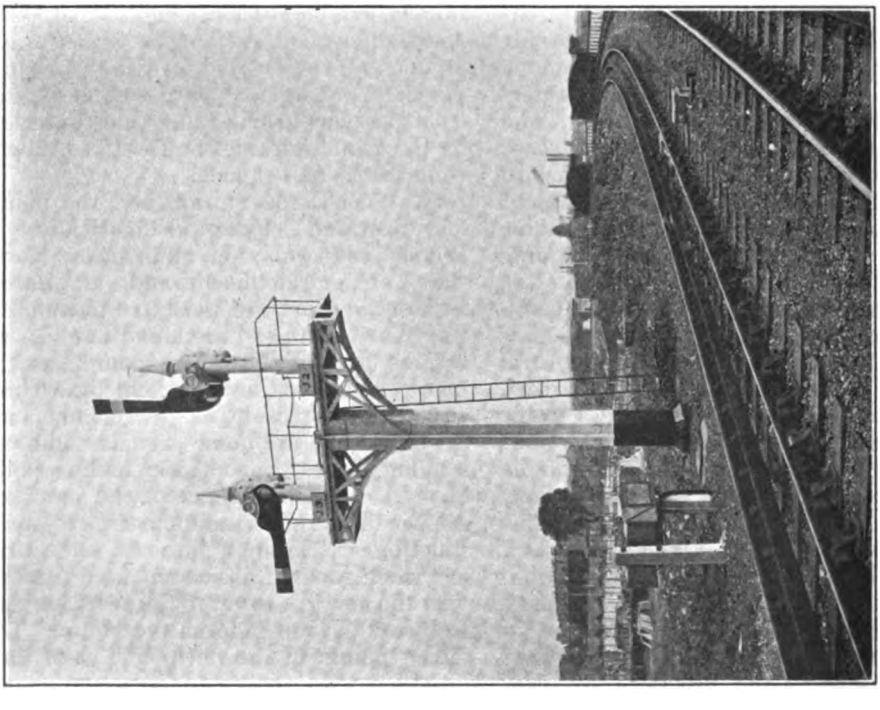


INNER HOME SIGNALS AND CALLING-ON ARMS, EALING BROADWAY.
Showing also Shunting Signals.



UP INNER HOME SIGNALS, WOOD LANE JUNCTION.

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alternating current equipment is provided; no bars, in accordance with the standard practice on the Underground, are coupled to the facing point locks, as all the point levers are locked by track circuits. Detectors electrically detect the position of the points, also of the facing point lock. The facing points at Wood Lane Station, Wood Lane Junction and North Acton are similarly detected.

Signals at Wood Lane Station are electro-pneumatic, also the dwarf signals on the new line at Ealing Broadway; otherwise except for those on the steam lines in connection at North Acton, which are mechanical, all signals on the new railway are electrically operated, and, in every case, whether semi-automatic or purely automatic, are controlled by track circuits. All, too, are three-position, upper-quadrant signals except the three on the West London connecting line.

Track circuit controls in each instance extend up to the next signal, in addition to which there is the overlap of, generally, 400 yards—in a few cases of 450 yards—beyond the next signal. Thus, before an automatic signal can rise from the horizontal position, or a semi-automatic can be moved therefrom, the section up to the next signal and for 400 yards or so beyond it must be unoccupied.

North Acton box can be closed and the running signals on the Ealing and Shepherd's Bush line converted into signals working automatically. To do this, certain levers, and those working the main line signals on the High Wycombe line, must be reversed and the block instruments for the latter line switched out.

There are four purely automatic signals on the down line which are lettered, and have track circuits and overlaps of 400 yards, and four on the up line. Semi-automatic signals are distinguished by having the usual square-ended arms of stop signals, whilst the arms of the purely automatic have pointed ends. The reason for this distinction is that a purely automatic signal at "danger" may be passed in that position by a train after it has come to rest and stood for one minute. The motorman must, however, proceed with care, prepared to stop short of any obstruction. Owing to the distance certain signals are from their respective boxes they are provided with telephones to allow a motorman, if detained, to communicate with the signalman. Telephones are also provided for some of the signals at Ealing Broadway, owing to the awkward access to the District Railway box, whence they are worked.

Except the three on the West London connection all signals work through the upper quadrant. With these three exceptions, too, all signals are of the three-position type:—(1) horizontal and a red light for "danger"; (2) at an angle of 45 deg. above the horizontal and a yellow light for "caution," *i.e.*, the next signal is at danger; (3) vertical and a green light for "clear."

When the section immediately in advance and its overlap are unoccupied and the next signal indicates either "caution" or "clear," the normal position of a purely automatic signal is at "clear"; when the section and overlap are unoccupied but the next signal is at "danger" the normal position is at "caution." Although all these signals are of the three-position type, each is not necessarily used to indicate all three positions. For instance, the upper arms controlling access to the terminal lines at Ealing Broadway lead to buffer stops and there is no subsequent section beyond; only the first and second positions are, therefore, given. Again, where an automatic signal is in the rear of a stop signal worked from a junction or other signal-box calling for special care it is not advisable that the arm should rise above the 45 deg. position.

Signal posts are of tubular pattern, mounted on concrete. Where bracket signals are employed the main post is of timber, as usual, and the short members or "dolls" are tubular. The mechanism is contained in a weatherproof, cast-iron case, secured to the tube. Arms are of corrugated stamped steel and enamelled. The operating mechanism is placed in a dustproof case, and includes a motor, which drives a train of gears, run on ball bearings. It is so arranged that the arm will move from the horizontal to either the 45 deg. or to the vertical at the one operation, or from the 45 deg. position to the vertical. Similarly it will move from the vertical to either the 45 deg. position or to the horizontal at one operation, or from the 45 deg. to the horizontal. Further, should it be necessary to reverse the direction of the arm whilst a move-

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AUTOMATIC SIGNAL AT "CLEAR."

ment is in operation, *e.g.*, to restore the arm to "caution" just as it is going to "danger," this is quickly done; moreover, it is achieved without injury to the mechanism.

Alternating current at 440 volts is supplied from the Old Oak sub-station to a main cable from which air-cooled line transformers step down to 100 volts for signal and point circuits and for the local winding of relays, &c. Track transformers step the 100 volts down to 5 or 6 volts wherewith to feed the track circuits through well-known thermal regulators. The track voltage is approximately 1·0 to 1·5 volts, and a small relay transformer at the relay end of the track circuit steps this up again to 15 or 20 volts for the purpose of energising the track winding of the track circuit. The secondary of the relay transformer is connected by a twin cable to the armature of a galvanometer type track relay fixed at the signal, and the local winding of this relay is supplied with current at 100 volts from the line transformer at the signal.

Shunting signals on the new line are very similar to those in use on the Great Western, except that they work clockwise, *i.e.*, the white face turns so that when the signal is "cleared"—it has two positions only—the left end of the red band rises and the right end falls.

Every running signal is provided with an automatic stop fixed outside the "off" rail, so arranged that when the signal is at "danger" the arm of the train stop will engage with a trip-cock on the motor. These stops are operated by independent electrical motors by means of a circuit in multiple with the 45 deg. position of the signal. The stop arm is fixed 3 or 4 ft. in advance of the signal so that a motor-man shall not be "tripped" unless he has actually passed the signal.

There has been adopted on the new line the new method of signalling during foggy weather and falling snow introduced on the Metropolitan Railway. At suitable places posts are erected lettered "Fog Repeater," and having an upper yellow lens and a lower green lens. These posts are usually fixed 200 yards to the rear of each signal, and when the signal is at "danger" the yellow lens is illuminated; when the signal is at "caution" or "clear" the lamp behind the yellow lens is switched out and the lamp behind the green lens switched in. The voltage of the lamps is 105; the 30-watt lamps are run on the 100-volt circuit. When the weather is such as to require the repeaters to be used the signalmen switch them in—each box

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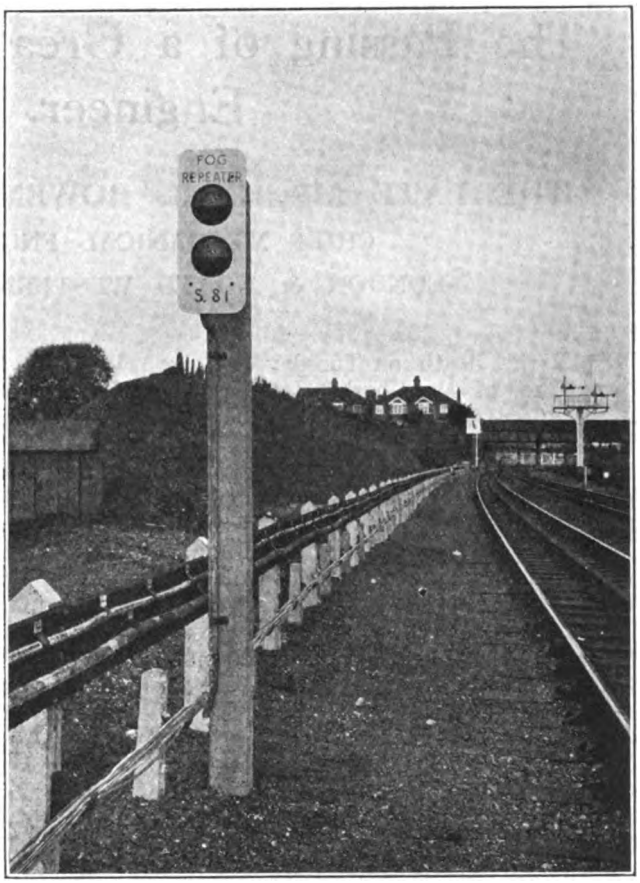
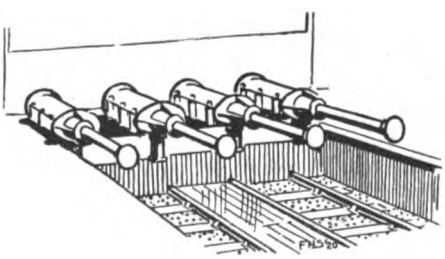
is responsible for the repeaters in its particular area.

Illuminated diagrams are fixed in all the signal-boxes which, through the track circuits, indicate to the signalmen whether the lines under their control are occupied or free.

The greater portion of the signalling work now described was designed and installed by the McKenzie, Holland & Westinghouse Power Signal Company, Limited, 57, Victoria Street, S.W. 1, to the instruction and under the supervision of Mr. A. T. Blackall, the Great Western Signal and Telegraph Engineer. The signal-boxes at North Acton and Wood Lane Junction were erected and the mechanical signalling at the former place laid down by the Great Western Signal Department. The new box and signalling at Wood Lane station were erected by the Underground Electric Railways Company of London, under the supervision of Mr. W. S. Every, the Signal Engineer, on behalf of Mr. Arthur R. Cooper, the Assistant Manager and Engineer for Maintenance. The two last-named gentlemen were responsible, too, for the work carried out by the McKenzie, Holland & Westinghouse Company on the District Railway at Ealing Broadway. With these exceptions all the signalling and its details—the automatic and semi-automatic signals, track circuits, automatic stops, illuminated diagrams, electro-pneumatic plants, &c.—were the work of the firm just mentioned. Maintenance of the signalling is performed by the Underground Electric Railways Company of London, under Mr. Every.



FOG REPEATER ON LEFT AND OUTER DOWN HOME SIGNALS, EALING BROADWAY, ON RIGHT.



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The Passing of a Great Locomotive Engineer.

THE LATE MR. C. J. BOWEN-COOKE, C.B.E.,

CHIEF MECHANICAL ENGINEER,

LONDON & NORTH WESTERN RAILWAY.

BY the death on Tuesday, October 19, of Mr. Charles John Bowen Cooke, C.B.E., Chief Mechanical Engineer, London & North Western Railway, the home railway world loses one of its most outstanding personalities. Moreover, although the late Mr. Bowen Cooke had only occupied the position of chief of the mechanical engineering department of the London and North Western Railway since the death of Mr. George Whale in 1909, his name had been a familiar one within a very wide range for many years previously. Indeed, we may almost suggest that his reputation as a clear, interesting and informative writer on locomotive engineering topics will last as long as the engines for the design of which, in later days, he was responsible.

Born on January 11, 1859, at Orton Longueville, near Peterborough, his father then being rector of the parish, Mr. Bowen Cooke was educated at King's College School, London, and in Germany. On February 1, 1875, he entered Crewe Works as a premium apprentice in 1878, becoming a private pupil of the late Mr. F. W. Webb. He was appointed in 1880 Assistant to Mr. Mumford, the then Superintendent of the Running Department for the Southern Division. During this period he produced his best known literary work, "British Locomotives," published in 1893. This went through several editions, and, in conjunction with the supplement, "Developments in Locomotive Practice," which appeared in 1902, is regarded as a standard work, distinguished by its clearness of explanation and its completeness of subject-matter within the range contemplated.

In 1899, when the late Mr. George Whale took over the entire control of the Running Department of the London and North Western Railway, Mr. Cooke became Assistant for the Southern Division, and in 1903, when Mr. Whale was made Chief Mechanical Engineer and the Running Department was again divided into two divisions—North and South—he was placed in charge of the latter with headquarters at Rugby. He was still holding that position when selected to succeed Mr. Whale in June, 1909.

In addition to the interest created by his published works, which also include contributions to the proceedings of the International Railway Association, Mr. Bowen Cooke was prominently associated with movements affecting the welfare and social activities of the railway staff, and with the affairs of the localities where he was domiciled.

Whilst at Rugby he took a keen interest in fire brigade work, and for upwards of 10 years was second officer of the Rugby Fire Brigade. He was also Hon. Secretary to the Railway Mechanics' Institute, and a member of the County Council Technical Education Committee. When the scene of his activities was moved from Rugby to Crewe, and the onerous duties of the post of the Chief Mechanical Engineer to the London and North Western Railway fell upon his shoulders, he still found time to interest himself in anything that related to the welfare of those working under him. He was instrumental in providing a club room and institute for veteran workmen who had served for many years in Crewe Works, and was identified with everything and anything which benefited his staff and any servants of the company in the locomotive department as a whole. He was the recipient of civic honours and in 1918-19 officiated as Mayor of Crewe.

Writing on the basis of close personal

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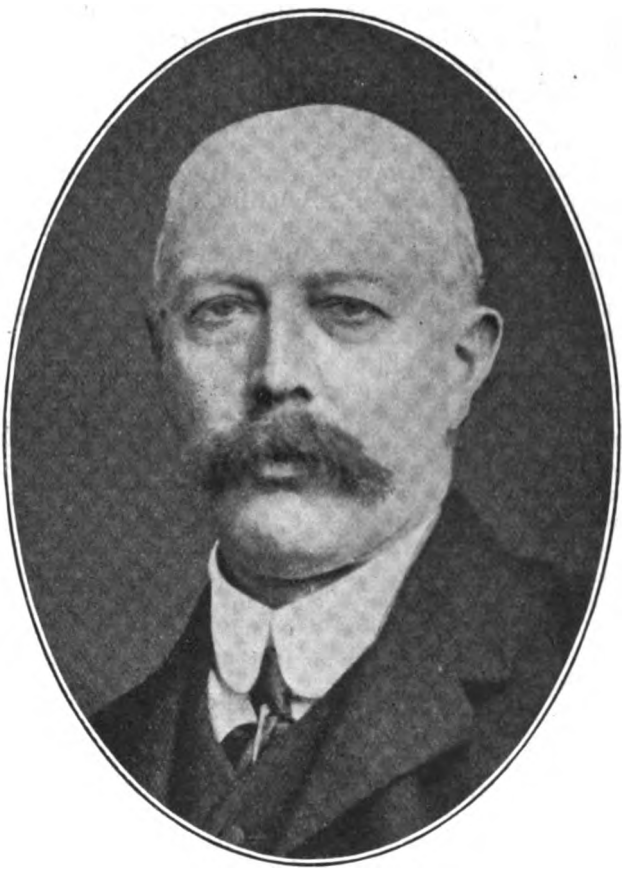
acquaintance, "C.S.L." remarks: "Mr. Cooke was before everything else a 'locomotive' man, and apart altogether from the duties of his office, had always been a great student of locomotive practice in this and other countries. In conversation with others on the topic he often astonished his hearers by the extent of his acquaintance with the differences of design existing on foreign railways, often remembering the exact dimensions and small diversities of construction about which most people would have had to consult works of reference. Mr. Cooke always enjoyed the reputation for being accessible to those who, working under him, sought his advice; anyone who had a legitimate grievance or a useful suggestion to make could always rely upon a ready hearing and sympathetic advice. He was one of those railway officers who believed strongly in the value of the technical press, and . . . he had the happy knack of imparting knowledge in an easy and informative manner. . . . Whilst being opposed to personal mention except when such was unavoidable, he always showed keenness that others should receive due recognition of their efforts. It was seldom that he used the pronoun 'I' in speaking of what transpired at Crewe, preferring 'we,' no matter how much others might consider him entitled to regard the matter in a personal sense. A man of stature and a commanding figure in any assembly, Mr. Cooke always seemed desirous to place others first and to talk about and give preference to their views where they concerned the subject of locomotives and railways."



THE LATE MR. C. J. BOWEN COOKE, C.B.E., M.INST.C.E., M.I.MECH.E.,

Chief Mechanical Engineer, London & North Western Railway, 1909–20.

Mr. Bowen Cooke was a member of the Institution of Civil Engineers and of the Institution of Mechanical Engineers, a Justice of the Peace for Cheshire, and a member of the Cheshire County Council. He also held the rank of major in the Engineer and Railway Staff Corps. During the war period much valuable work of a special nature was carried on at Crewe, and in recognition of exceptional services rendered, Mr. Bowen Cooke received the order of Commander of the Order of the British Empire.

As a locomotive engineer Mr. Bowen Cooke will be long remembered by his 4-4-0 superheater locomotives of the "George the Fifth" class, and its successors of various types. Developed upon the basis of the work of his predecessors, these engines yet created a new era in locomotive engineering. Mr. Cooke was, indeed, one of the first in this

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country to appreciate the value of high degree superheating, and for some years was one of the leading exponents of superheater practice, now a standard feature on every railway.

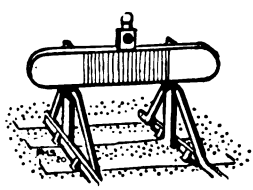
Also indicating the policy of development, the "Prince of Wales" class may be described as the superheater equivalent to the "Experiment" class; while the vogue of the eight-coupled locomotive, with superheating apparatus in all the later ones, belongs almost entirely to the period during which Mr. Bowen Cooke was the responsible chief officer at Crewe. In addition were the 4-6-2 superheater tank engines, the 0-8-2 shunting engines, the superheated "Precursors" and the converted compounds of the "Renown" class.

Mr. Bowen Cooke's outstanding locomotive design is, however, that of the "Claughton's," including distinct variations from previous Crewe practice, the Belpaire boiler, Walschaert valve gear, and many features of dimensions, construction and fittings and appliances. These engines have achieved many remarkable performances, and the design as a whole ranks as one of the most distinctive and outstanding in British practice.

His work at Crewe, however, extended far beyond that of locomotive construction and design. Improvements in works methods and in the equipment of the shops had much to do with the large amount of special work performed at Crewe for war purposes. Among the most outstanding may be mentioned the installation of a 4-ton drop hammer, the heaviest employed in any railway workshop in the country. The erection and operation of this very powerful appliance were attended by difficulties of an almost insuperable character. It was installed in order to tackle a special Government job of a pioneer nature, considered almost impracticable as a drop forging, but urgently required by a War department. Mr. Cooke and his assistants devoted their attention and energies to overcoming the formidable task involved, and after some initial failures, mainly concerned, we believe, with disturbance of the foundations owing to the very heavy impact, complete success was achieved, the efforts made being recognised by the Minister of Munitions, who addressed to Mr. Cooke a congratulatory letter which he asked should be brought to the notice of everyone who had been concerned in the achievement. This was followed by a second letter at a later date congratulating the chief mechanical engineer and his staff on the successful production of the stamping, which latter consisted of the front stiffening band of the cradle of a 6-in. 26-cwt. howitzer.

Another of Mr. Cooke's achievements during the war period was that of converting a number of Ford chassis for use on narrow gauge railways in France. Mr. Cooke bought up such Fords as he could obtain, converted them at Crewe and sent them over to France, where they were soon at work behind the lines taking up loads of shells to the ammunition centres. He also built two armoured trains and supplied numerous other forms of output required for military purposes of one kind or another.

In many ways, therefore, Mr. Bowen Cooke ranked as one of the leading locomotive and mechanical engineers of the day, and his death, at the comparatively early age of 62 years, is a distinct loss to the locomotive engineering profession, to the railway world as a whole, and to the nation. The funeral took place at St. Just, near Falmouth, where he died, on Friday, October 22, and the same day a memorial service was held at Christ Church, Crewe.



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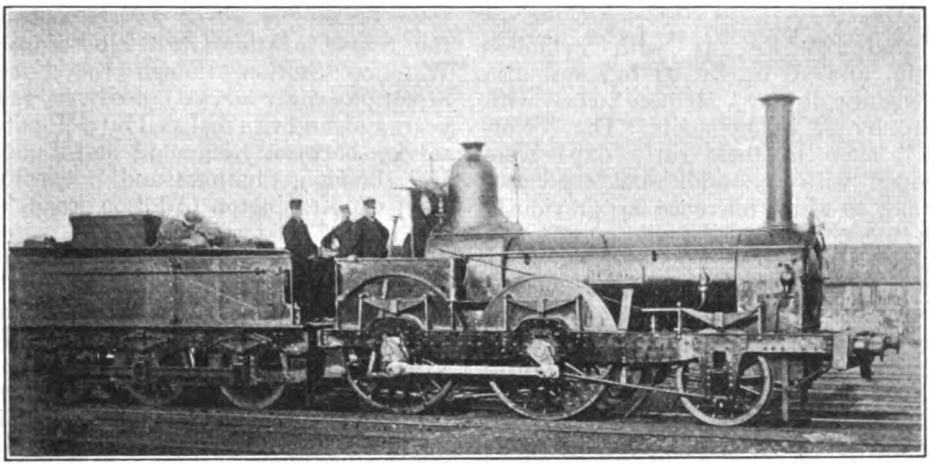
Locomotive and Train Working in the latter part of the 19th Century.

THE LONDON & SOUTH WESTERN RAILWAY. [No. III.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

IN addition to the standard types of passenger engines enumerated previously, there were others of older classes which were used on branch passenger and goods trains. One of these classes consisted of a baker's dozen of 2-4-0 engines of very antiquated appearance, which differed from the usual type of South Western passenger engines in that they had inside cylinders and outside frames. They owed their origin to the designs of Mr. John V. Gooch, who preceded Mr. Joseph Beattie in the chief locomotive superintendency. They had coupled wheels 5 ft. 6 in. diam. and cylinders 15 in. by 22 in. In their earlier days they were often to be found on the Windsor and Reading trains from Waterloo, but afterwards were relegated to Northam shed, whence they worked local trains in the Southampton and Portsmouth districts. They had been built at Nine Elms during the period 1851 to 1855, and were scrapped between 1880 and 1885 with the original boilers. These old veterans were as follows :—

21. *Prince.*	40. *Windsor.*
26. *Gazelle.*	41. *Ajax.*
31. *Leeds.*	42. *Atlas.*
32. *Eclipse.*	43. *Milo.*
35. *Vivid.*	44. *Pluto.*
37. *Arab.*	47. *Taurus.*
	48. *Hercules.*



2-4-0 INSIDE CYLINDER PASSENGER ENGINE, No. 31, "LEEDS."

Designed by Mr. J. V. Gooch and built at Nine Elms, 1852. Coupled wheels, 5 ft. 6 in. diam. Cylinders, 15 in. by 22 in.

These engines were on the duplicate list and all had been removed from the capital list in 1871-4 by Mr. W. G. Beattie, who had replaced them by standard outside-cylinder engines. They nevertheless lasted with their old names and numbers for some ten years longer.

There were one or two other four-coupled passenger engines of another type with inside cylinders, which do not merit special mention, and the last two of this class disappeared in 1880–1.

The other 2-4-0 engines were goods engines with 5 ft. wheels, the "Norman" class consisting of 12 engines, 124 to

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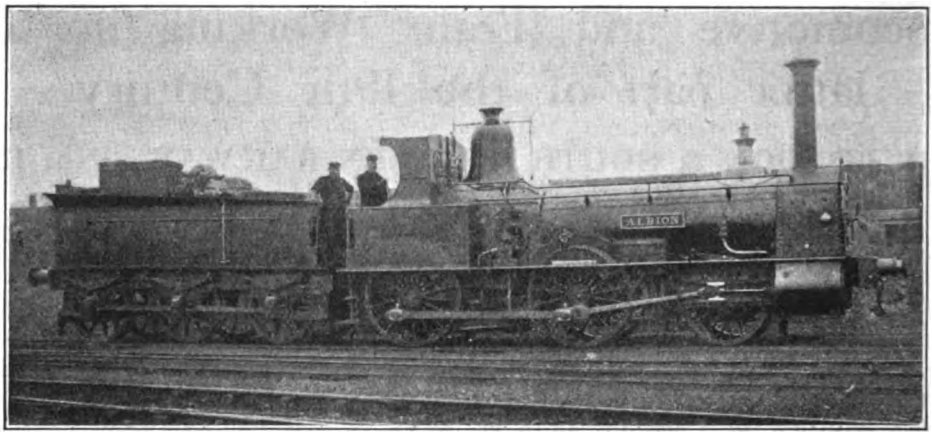

2-4-0 GOODS ENGINE, No. 129, "ALBION."

Designed by Mr. J. Beattie and built at Nine Elms, 1855. Coupled wheels, 5 ft. diam. Cylinders, 16 in. by 22 in.

129 and 136 to 141 with cylinders 15½ in. and 16 in. by 24 in., and also six engines of the "Medusa" class with 16 in. by 22 in. cylinders. The "Norman" class in their early days were provided with the additional condenser chimney to which reference has previously been made. A considerable number of these engines lasted from 1855–7, when they were built at Nine Elms, until Mr. Adams broke them up in 1885–6, and in their declining years worked stopping goods trains between Portsmouth, Southampton and Salisbury. The "Medusa" class, consisting of engines (55) *Medusa*; (56) *Mentor*; (57) *Meteor*; (67) *Aeolus*; (78) *Hecate*; and (107) *Gem*, were also on the same service and were broken up in 1885–6.

The London and South Western had a very extensive suburban traffic in the London area, and an army of Beattie's celebrated little 2-4-0 tank engines was stabled at Nine Elms, Twickenham, Kingston, Guildford and other sheds for this traffic. The service was very much as it was until recently, but at one time there was a through service for City people between Cannon Street (South Eastern Railway) and Richmond, via the junction line at Waterloo.* It is only two or three years since this junction line disappeared from the railway map in the course of the latest alterations to Waterloo Station, though the Cannon Street passenger service ceased very many years ago, and was replaced by a circuitous service between Richmond and Ludgate Hill (London, Chatham and Dover Railway) via Kensington (Addison Road) and Brixton. This service has only recently disappeared as a result of the war. During the "seventies" and early "eighties" a considerable number of Beattie's little tank engines were to be seen at Holborn Viaduct, chiefly those numbered between 250 and 270, for not only did they work the above-mentioned Richmond service, but also a service between Holborn Viaduct and Wimbledon via Tulse Hill.

Of Beattie's 2-4-0 tank engines there were 79 engines similar to the illustration on page 393. Of these, Nos. 177 to 220, 243 to 270, 298, 299, 314 and 34 (the latter named *Osprey*) had been constructed by Messrs. Beyer, Peacock & Co., between 1863 and 1874, and three similar engines, Nos. 33 *Phœnix*, 36 *Comet* and 76 *Firefly* at Nine Elms in 1871. These engines had 5 ft. 6 in. coupled wheels, and cylinders 15½ in. by 20 in., except a few of the later ones which had 16 in. by 20 in. cylinders. Six additional engines, Nos. 44 and 325 to 329, built by Beyer, Peacock & Co. in 1875, were of Mr. W. G. Beattie's modified design and had side tanks in place of the older well tanks. As tank engines for dealing with a heavy suburban service they appeared somewhat

* The engines were, however, changed at Waterloo.

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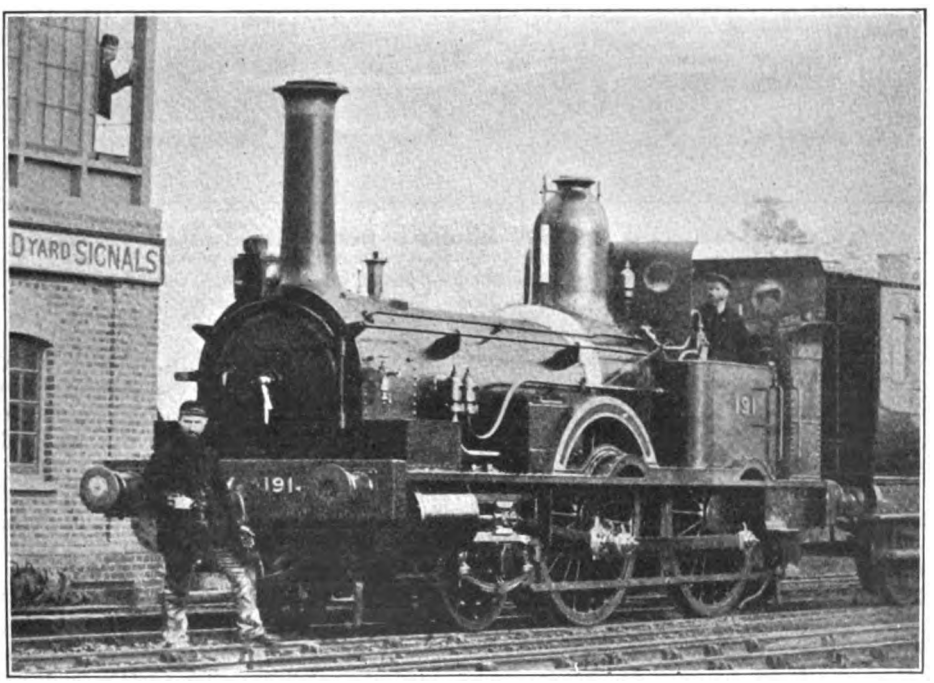
undersized, but, appearances notwithstanding, it must be freely admitted that they were extremely smart and successful little engines, and general favourites with both officials and men. The domes and bands round the splashers were of polished brass, and they were all provided with the standard feed-water heating apparatus. Although a few of them were stationed for work on west country branches, by far the greater number were used for London suburban traffic.*

There were six other 2–4–0 well tanks with outside cylinders of Joseph Beattie's older designs. Three of these, the *Nelson*, *Howe* and *Hood*, Nos. 143 to 145, built at Nine Elms in 1858, had 5 ft. wheels and 15½ in. by 20 in. cylinders, whilst the *Nile*, *Cressy* and *Hogue*, Nos. 154 to 156, built in 1859, had 5 ft. 6 in. coupled wheels, and 14½ in. by 20 in. cylinders. They were much plainer-looking engines than those built afterwards and had closed splashers and painted domes, and were used on odd branches between Southampton and Weymouth, and also on shunting duties. I have always cherished an affectionate regard for the old *Nelson*, for this was the engine on which I made my first footplate trip, now many years ago. I was then a hopeful youngster of eight, and at that time the *Nelson* was a sort of "odd-job" engine at Weymouth, which was sometimes called upon to work the service between Weymouth and Portland. During a six weeks's stay at Weymouth I passed a very large portion of my time at the railway station, in the course of which I made friends with the driver who worked the Portland branch train. After some cajoling I eventually succeeded, to my great joy, in spending part of a pleasant day as a guest on the footplate of the branch engine, as a result of which I missed my midday meal and arrived home at tea-time encased in a covering of coal-dust and grease of considerable thickness. I also acquired a somewhat superficial knowledge of certain footplate taps and handles, and a severe physical castigation at the hands of an

* Three of these engines, Nos, 298, 314 and 329 are still (1919) at work at Wadebridge in Cornwall.



STANDARD 2-4-0 TANK ENGINE, No. 191.

Designed by Mr. J. Beattie and built by Beyer, Peacock & Co., Ltd., 1863. Coupled wheels, 5 ft. 6 in. diam. Cylinders, 15½ in. by 20 in.

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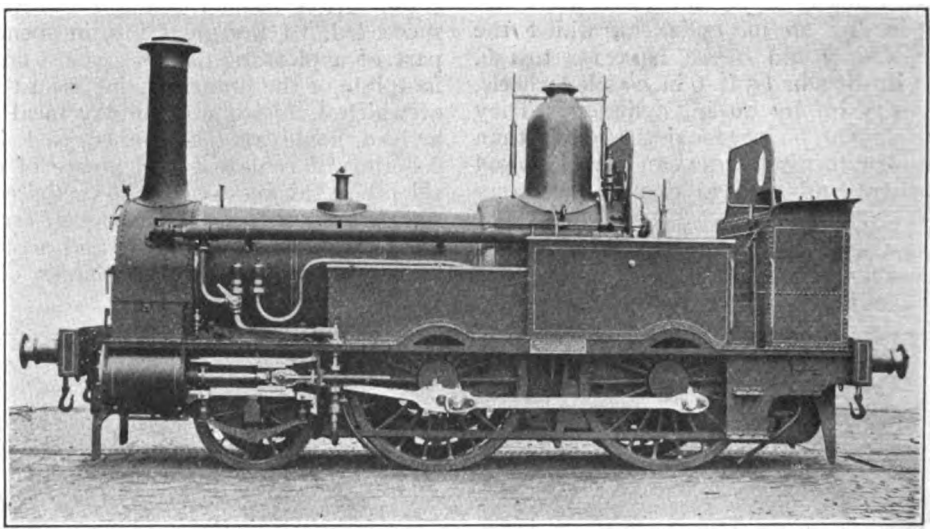
irate parent who had no soul for locomotives. I regret to say that I afterwards forgot some of the details of my dearly-bought footplate education, but I still have a vivid recollection of the subsequent proceedings.

The only other passenger tank engines of Beattie's days were Nos. 318 to 323, of the 4-4-0 type designed by Beyer, Peacock & Co., and so long associated with the Metropolitan and District Railways. In fact they were practically of the same design with 5 ft. 9 in. wheels, outside inclined cylinders 17 in. by 24 in., and leading bogies, and were turned out and were transferred to the London end of the line, where they mostly worked on the Leatherhead service from Waterloo, two of them being stationed at Leatherhead for this purpose. During a great part of the "eighties" two or three of them were quartered at Dorchester to work certain goods trains (from which the main line engines came off at this station) between there and Weymouth.

The six-coupled goods engines all had inside cylinders. It is worthy of remark that all those British locomotive engineers of the past who were advocates of outside cylinders for four wheels coupled express



2-4-0 PASSENGER TANK ENGINE, MODIFIED DESIGN (Nos. 44 and 325-329).

Designed by Mr. W. G. Beattie and built by Beyer, Peacock & Co., Ltd., 1875.
Coupled wheels, 5 ft. 6 in. diam. Cylinders, 15½ in. by 20 in.

from the works of the above-mentioned firm in the early part of 1875. They differed from the Metropolitan engines in that they were without condensing apparatus, and they had awnings over the footplate. Originally these engines were intended for the fast passenger service between Exeter and Plymouth, and were generally referred to as the "Plymouth" tanks. They were not popular with the men, for although they were very good engines, they suffered from the grave inconvenience of having to be coaled from the footplate, to the accompaniment of a chorus of bad language. They did very little work on the Plymouth road, and passenger engines in nearly every case drew the line at outside cylinders for six-coupled tender engines of the 0-6-0 type, the only exceptions being the 41 engines on the Caledonian, which have been referred to in a previous article. The result was that this type of outside cylinder engine, so popular on Continental railways in all countries, was conspicuous by its absence on British railways. The four successive locomotive superintendents of the London and South Western, Messrs. J. V. Gooch, Joseph and W. G. Beattie, and William Adams, were all outside cylinder men in so far as express engines were concerned, but all of them adhered

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rigidly to inside cylinders for 0-6-0 goods engines.

Mr. Joseph Beattie's goods engines, all of which were built at Nine Elms, were somewhat small engines, the cylinders being only 16½ in. by 22 in., the coupled wheels having a diameter of 5 ft. These had inside frames only, but there were also 24 larger goods engines with double frames and 17 in. by 24 in. cylinders, the main design of which was due to Messrs. Beyer, Peacock & Co., except that the boilers of the first twelve of the class built in 1866 were distinctly Beattie's. Thirty-six inside-framed goods engines built 1874-1878 under Mr. W. G. Beattie's superintendency, were distinctly of Beyer, Peacock's design as regards details. These engines, Nos. 302-313, 336 to 347, 368 to 373, and six others with odd numbers, had 5 ft. wheels and 17 in. by 24 in. cylinders. They worked most of the main line goods trains between London and Salisbury and London and Southampton, whilst the second batch of double-framed goods engines, 273 to 278, and 285 to 290, were generally to be found on the Salisbury-Exeter road, until they were replaced on this service by Mr. Adams's heavier engines.

The fast night goods from London to Plymouth was run by the 302 class; it was supposed to be something very superior in the matter of goods trains and went by the name of the "Tavy."

There were also eight special six-coupled engines with 4 ft. 6 in. wheels and 16 in. by 20 in. cylinders, which went by the name of the "Ilfracombe" engines. These were by Beyer, Peacock & Co. (1873 to 1880), Nos. 282 to 284, 300, 301, 324, 393 and 394, and worked exclusively on the North Devon section. They must have been very suitable for both passenger and goods trains on this line, for the last two of them were ordered by Mr. Adams. They had Beattie type domes over the fireboxes, but the latter in all the class were flush with the boiler barrels instead of raised as was the usual practice at that time on the South Western. Some of these engines were sold four years ago to the Shropshire and Montgomeryshire Railway.

(*To be Continued.*)

Locomotive and Train Working in the Latter Part of the Nineteenth Century.

Railways already dealt with in the "Railway Magazine" by Mr. E. L. Ahrons are:—

L. & N.W.: Jan., Feb., March, May, 1915. (All out of print.)

GREAT NORTHERN: June, July, 1915. (Both out of print.)

MANCHESTER, SHEFFIELD & LINCOLNSHIRE: Aug., Sept., Oct., 1915. (Aug. and Oct. out of print.)

GREAT WESTERN: Nov., Dec., 1915. Jan., Feb., March, April, May, June, July, Aug., 1916. (All out of print.)

GLASGOW & S.W.: Sept., Oct., 1916. (Both out of print.)

GREAT EASTERN: July, Aug., Sept., Oct., Nov., Dec., 1918. (Dec. out of print.)

NORTH EASTERN: Nov., Dec., 1916. Jan., Feb., March, April, May, 1917. (All out of print.)

SOUTH EASTERN: June, July, Aug., 1917.

LANCASHIRE AND YORKSHIRE: Sept., Oct., Nov., 1917.

LONDON, CHATHAM & DOVER: Dec., 1917. Jan., Feb., 1918. (Jan. out of print.)

CALEDONIAN: March, April, May, June, 1918.

LONDON BRIGHTON & SOUTH COAST: Jan., Feb., March and April, 1919. (First three out of print.)

MIDLAND: May, June, July, Aug., Sept., Oct., Nov., Dec., 1919. Jan., Feb., March, 1920.

NORTH BRITISH: April, May, June, July, Aug., Sept., 1920.

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The Grouping of British Railways.

AN ALTERNATIVE TO THE GOVERNMENT SCHEME.

IN the August RAILWAY MAGAZINE particulars were given and comments made in regard to the proposed grouping of British railways, as set forth in a White Paper issued in July by the Ministry of Transport. It will be recalled that seven groups were to be constituted as follows :—

(1) *Southern*, combining the South Eastern and Chatham, London, Brighton and South Coast, and London and South Western Railways.

(2) *Western*, the present Great Western system with the Welsh lines.

(3) *North Western*, combining the London and North Western, Midland, Lancashire & Yorkshire, North Staffordshire and Furness Railways.

(4) *Eastern*, combining the Great Northern, Great Central and Great Eastern Railways.

(5) *North Eastern*, the present North Eastern system and the Hull and Barnsley.

(6) *London Group* (local lines).

(7) *Scottish Group*.

Proposals for what is termed the "districting" of British railways are by no means new, but there is probably no country where railways are so interwoven as in our own, so that any scheme for combining by companies cannot take account of the complexities due to this fact. Indeed, the Government proposals were only presented as an "outline" to form the basis of a more detailed scheme to be embodied in the promised Parliamentary Bill which is to settle the future of British railways.

As showing the inadequacy of the suggested grouping, it is sufficient to mention the fact that the inclusion of the Great Central Railway in the Eastern group would mean that the same management would have to direct the affairs of lines serving the Eastern Counties, and parts of the Cheshire and Lancashire coasts, with at least one incursion into Wales. As at present operated, Great Central interests on the east and the west coasts are, of course, properly co-ordinated, but if the Eastern group is to justify its name its west coast activities would be entirely out of place.

Similar objections could be applied to most of the other proposals, while in many quarters it is considered that the groups would be too unwieldy for central management, and that in several instances there is an inequitable combination of what may be termed "prosperous" and ordinary mileage. For this and other reasons it is not surprising that the Government proposals have failed to meet with approval from people in a position to appraise them.

It is, however, one thing to criticise a scheme of this kind destructively, and another to render useful service by producing a suitable constructive alternative. We therefore welcome the publication by our contemporary, the *Railway Gazette*, of an alternative scheme which appears to offer many good points and to provide a more suitable basis upon which to develop a final scheme than that provided by the Government. It may not meet with universal approval and it would involve a degree of pruning and adjustment; but we take it that if the grouping by companies proposed by the Government had been carried out a great deal of this pruning and adjustment would still have been necessary, and we fail to see why the main problems should not be tackled first instead of last.

As will be seen, our contemporary's scheme, as set forth on the opposite page, increases the number of companies to be retained to eleven, as compared with six, each of these being based upon one (or more) of the present larger companies as nucleus, with the exception of the Great Central.

Companies which already have clearly defined territories, such as the London, Brighton and South Coast, South Eastern and Chatham and Great Eastern, are left virtually as they are. The Great Western Railway, too, is left very much to itself, except that it would take under its wing

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Name of New Company.	Present Railways to be Absorbed.
London and North Western Railway Approximate Route Mileage, **2,800.**	Present London and North Western system (except lines west of Craven Arms) ; North Staffordshire ; Furness ; Maryport and Carlisle ; Cleator and Workington ; Cockermouth, Keswick and Penrith ; Carlisle to Glasgow and Carstairs to Edinburgh, Caledonian Railway.
Midland Railway .. .. Approximate Route Mileage, **3,200.**	Present Midland system (except lines west of Hereford) ; Glasgow and South Western ; Carlisle to Edinburgh, North British Railway ; Hull and Barnsley ; Midland and South Western Junction ; Stratford-on-Avon and Midland Junction ; G.C.R. lines (Woodford to Manchester and Chesterfield, and Sheffield to Lincoln) ; Cheshire Lines.
London and North Eastern Railway Approximate Route Mileage, **3,400.**	Present North Eastern system ; Present Great Northern system, except lines west of Wakefield and Leeds ; G.C.R. Lincolnshire lines (including Immingham and Grimsby) ; Berwick to Edinburgh and Border lines, North British Railway.
Great Eastern Railway .. Approximate Route Mileage, **1,400.**	Present G.E.R. system ; Midland and Great Northern Joint ; Colne Valley, Southwold, Mid-Suffolk.
South Eastern and Chatham Railway Approximate Route Mileage, **700.**	Present South Eastern and Chatham system ; East Kent ; Kent and East Sussex.
London, Brighton and South Coast Railway Approximate Route Mileage, **500.**	Present London, Brighton and South Coast system ; Chichester and Selsey.
London and South Western Railway Approximate Route Mileage, **1,200.**	Present London and South Western system ; Somerset and Dorset Joint.
Great Western Railway .. Approximate Route Mileage, **3,600.**	Present Great Western system ; Local lines in South Wales (including London and North Western lines west of Craven Arms, and Midland lines west of Hereford) ; Cambrian ; Wrexham, Mold and Connah's Quay, G.C.R. ; Wirral (and G.C.R. lines in Wirral peninsula) ; G.C.R. Joint line to Ashendon (Marylebone to be relief terminus for Birmingham and Birkenhead lines) ; G.C.R., Ashendon to Woodford and Banbury to Woodford.
Lancashire and Yorkshire Railway Approximate Route Mileage, **800.**	Present Lancashire and Yorkshire system ; Portions of G.C.R. and G.N.R. systems not absorbed in other systems, as above mentioned ; Dearne Valley ; South Yorkshire Joint.
Edinburgh and Glasgow Railway. (Alternative title—Caledonian Railway.) Approximate Route Mileage, **1,500.**	Would be the "Lancashire and Yorkshire Railway of Scotland," Comprising those portions of the North British and Caledonian systems not taken over by the London and North Western, London and North Eastern and Midland systems (except as below).
Highland Railway .. .. Approximate Route Mileage, **1,000.**	Present Highland system ; West Highland Railway (north of Helensburgh) ; Great North of Scotland Railway ; Callander and Oban Railway.

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the various Welsh lines, most of which, especially those in the south, are already intimately associated with it. Sections of the Midland and London and North Western lines which penetrate into the same area are also to be added to the system, while in the Wirral peninsula and its neighbourhood the Great Central lines are to be incorporated.

Otherwise, the principal change is the formation of three trunk line companies based respectively upon the present Anglo-Scottish through routes. Seeing that Carlisle and Berwick are chiefly important as frontier stations, the extension of the through routes to the two chief cities of Scotland is the natural corollary, the London and North Western system including the Caledonian routes to Glasgow and Edinburgh; the Midland, the Glasgow and South Western and North British routes from Carlisle to Glasgow and Edinburgh respectively; and the London and North Eastern, the North British section from Berwick to Edinbu gh. With each are associated the various principal routes which appear naturally to go with them. Incidentally it may be pointed out that the Government scheme would leave each of these routes in the hands of two or three companies as at present, so that the proposed alternative is much more nearly in accord with the circumstances of this important traffic.

In the North Midlands, the Lancashire and Yorkshire Railway is to be retained as a separate entity in view of its complicated network of lines, though inevitably many sections of the three trunk line companies are interwoven therewith. In somewhat the same manner the Scottish networks of lines are to be operated as a separate system, while the new Highland company would deal with all Scottish lines north of the main Perth and Aberdeen routes.

As will be seen, no attempt is made to equalise mileage. That, we consider, would be undesirable, if not impracticable. Indeed, adopting volume of traffic as a basis instead of mileage, it would be equally impossible to make anything like an even distribution. Within the limits set forth, however, each of the proposed systems should become a workable entity, giving scope for efficient management in the highest degree and permitting of the fullest development of traffic methods. Competition, in so far as it is good, would still find considerable scope, and, seeing that the Government scheme also laid itself open to the charge that many competitive routes would still remain, it is a good feature that, as now proposed, such possibilities are fairly equitably distributed. The partitioning of the Great Central system as suggested may possibly not meet with general approval. An alternative is to combine it with the Lancashire and Yorkshire system, but it would appear that almost any redistribution scheme must involve the dividing up of this system to some extent.

Another point in this scheme is that it would simplify the matter of the future of the Cheshire lines, a system at present jointly owned by the Great Northern, Great Central and Midland. Under the Government scheme the Great Northern and Great Central would be in one group and the Midland in another. Under the scheme here outlined, the Great Central and Great Northern interests would be sold to the Midland, and the Cheshire lines form an integral part of the Midland system.

It may be suggested that the association of the Highland and Great North of Scotland Railways would form a somewhat "lean" group; but the circumstances of these lines would probably justify a Government guarantee, in view of the characteristics of the areas served, especially by the former.

In regard to the London group of local lines, as proposed by the Government, it is not clear whether this is intended to include the suburban lines of all the railways running into London, or whether it is merely intended to apply to the Tubes, District and Metropolitan Railways. It is contended that no useful purpose would be served by such a group. Under the scheme here outlined, each of the lines running into London would continue to conduct its own suburban traffic. The North London Railway is already worked as a portion of the London and North Western system, and the District and the Tubes and the Metropolitan might well be left to develop their business in the same efficient way as they have done in recent years.

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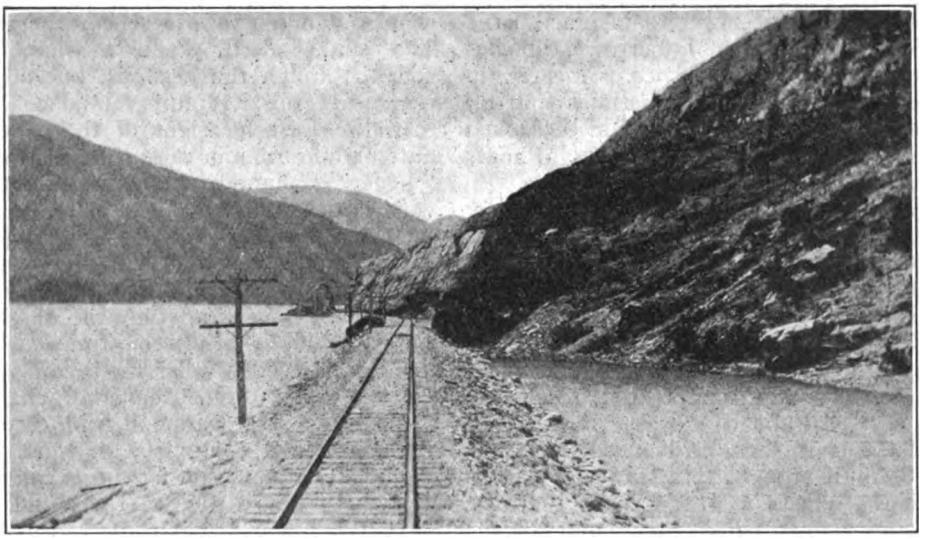

A TYPICAL SCENE IN THE CANADIAN 'ROCKIES."

A Striking Railway Journey.

By NORMAN THOMPSON.

ON a certain June evening, whilst the writer was engaged in packing his "grip," indulging meanwhile in pleasurable anticipations of a 1,600 mile railway trip, a "twister" (or species of cyclone) struck the City of Winnipeg, and amongst other destructive activities caused by its brief visitation, put out of commission the electric lighting at the Union Station.

A general strike had been in progress for a long period, and it was expected that a section of the railwaymen would also cease their labours at an early date; consequently when the station was found to be in total darkness, one's hopes of reaching Vancouver grew dim indeed.

However, other intending travellers were vanishing within the forbidding portal, and on entering one was cheered by the kindly gleam emitted by about half-a-dozen hand lanterns disposed at strategic points in the great dome-covered concourse. The ticket clerks had already joined the "Don't Worry" and "Don't Work" brigade, and no attempt was being made to transact the usual business of a large station under those circumstances. The silent procession filed straight through the gloom and felt its way, untroubled by the customary demands for destination, up the steps to the platform.

The train was drawn up alongside, already crammed with people anxious to complete their journeys before the threatened tie-up should occur; and a seat in the day coach proved the best accommodation that could be secured for the first two nights of the journey.

After a time an ominous silence gradually became noticeable; no engine had put in an appearance, and so the usual preliminary of testing the brakes, with other familiar sounds heralding an impending departure, failed to run their accustomed course. The cheerful remark of an optimistic passenger before seeking his berth: "We shall be off in two minutes," was received with a mental reservation of "Two hours, if lucky," a forecast that pretty nearly hit the mark.

It was a sultry night and many promenaded the platform with portions of clothing carried over the arm, the darkness rendering the absence of conventional attire of less moment than ordinarily. One joyous feature relieved the

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otherwise depressing circumstances—the welcome presence of a barrow still containing some blocks of ice. A carefully calculated kick would sometimes split off a few sizeable pieces that could be sucked with much relish; and the frigid mass therefore sustained frequent attacks.

At length the engine backed on, but by this time an incoming train was due, and it would be necessary to await its arrival on account of a short length of single track outside the station.

This train having materialised, hopes of a speedy departure revived, only, however, to be again disappointed. Suddenly the cry "All aboard" broke the stillness, and the train slowly advanced for a few yards until brought to a stand by a stentorian "Whoa!" It appeared that the fireman had reached that point in his cogitations when it seemed good to throw in his lot with the strikers' brigade, and as the engineer pulled the throttle he unostentatiously slipped off and melted away into the darkness.

A substitute was ultimately obtained, and the first stage of 55½ miles to Portage la Prairie covered in exhilarating style; but on arrival here the new fireman vanished like his predecessor, and silence once more settled upon the scene until someone could be aroused from sleep and routed out of his shack to fill the void.

After this, the journey continued to the next divisional point without incident, and one was glad of the opportunity to get breakfast in the town at the matutinal hour of 5 a.m. Absence of a dining car on the train soon led to a quite "Gilbertian" situation with which the wayside station of "Mikado" was to become identified.

At Kamsack, another divisional point, a number of passengers bound for Vancouver, acting under a misapprehension, proceeded up town and commenced a substantial repast. The railway authorities had, however, selected Canora, 24 miles further ahead as the stopping place for the midday meal, and consequently on reaching Mikado, orders were received to await the arrival of the tardy ones who intended pursuing in an automobile.

The hours passed and all concerned gradually became more and more hungry. There was nothing of interest to be seen, only the boundless expanse of prairie stretching away on either hand to meet the horizon, with a few dismal-looking shacks standing forlornly near the track. The sun, indeed, kept its appointed course through the heavens, but all else remained still. At intervals one would scan the East for signs of the expected auto, while rumour also had it that a "jigger" or handcar running on the track would herald our welcome release.

The conclusion of the wearisome sojourn was brought about unexpectedly—a message from Canora saying that the auto had gone there direct and that the absentees were calmly awaiting the train at that point. The seven miles intervening were quickly covered and a general "charge" of famished passengers and train crew, up the main street, took place.

The accommodation for meals consisted of two Chinese cafés, to right and left, respectively, and he who wavered in choice was lost indeed. The two establishments were almost instantly crowded, but the writer was fortunate in securing quite a satisfactory meal, seated near the enginemen, with a view to avoiding the fate of the Kamsack celebrities; for the Celestials went about their business imperturbable and quite unmoved by the most pathetic appeals for haste. Hurrying back to the station in the wake of the engineer and fireman, the train was soon slowly drawing out to the West.

This was too good to last and progress ceased on clearing the junction switch, when a couple of mixed trains proceeded in leisurely manner to occupy the one and only platform track. After their departure "No. 1" backed down and came quietly to rest once again in Canora Station.

A discrepancy was now discovered between the number of passengers that had actually arrived in the auto and that reported by Kamsack station as having been left behind there. A theory thereupon was framed to the effect that a second auto-load might perchance be wandering on some part of the prairie, and it was ordered that the train be held until the mystery had been duly cleared up.

The culprits, who had caused our delays, far from being overcome with remorse at all the trouble they had given, were filled with indignation at the necessity they had been under of paying a stiff rate for the automobile ride.

Some of the conductors in charge of the various cars were new employees and

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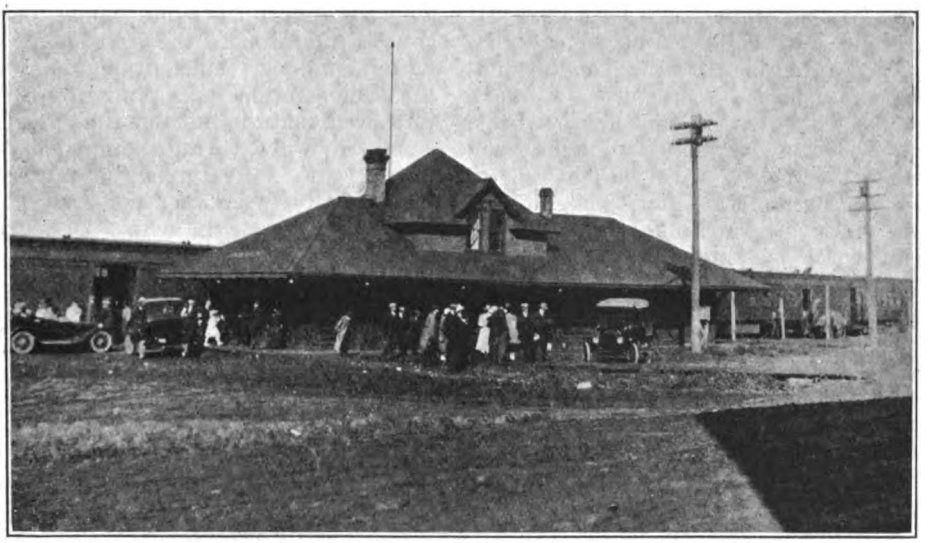
not experienced in accounting for tickets, hence the process of "checking up" all the passengers proved rather tedious. Each individual was asked to contribute any information possible as to persons formerly in his car who might be amongst the supposed missing ones. Finally, it was decided that all had arrived in the original auto, and the journey was resumed and continued unchecked till the day but one following.

During the night a spectacular thunderstorm took place, and as the writer was still cramped up in a crowded day coach the fantastic play of the lightning over the wide expanse of sky, unobscured by any obstruction on the prairie, could be viewed to advantage.

The next incident occurred amongst surroundings of an entirely different nature. Winding round a sharp curve in the Rockies there came a sudden application of the brakes that brought many passengers skipping along the ballast to form a curious group round the engine. Beneath the bogie frame were wedged some remnants of a handcar, the greater portion of which, however, had been thrown clear of the track by the engine pilot. The section men who were on their way to work jumped and escaped damage, but their dinner was not so fortunate, and the landscape became decorated with pork and beans. The train men and track men respectively occupied the centre of the little crowd, holding an argument regarding allocation of responsibility for the affair. The matter having been adjusted, a few vigorous wrenches accomplished the removal of the wreckage, and Westward Ho! became once more the refrain of the revolving wheels.

An arrival in Vancouver at soon after midnight now seemed within the bounds of possibility, but this hope was doomed not to be realised. On reaching Boston Bar, the last point at which a change of engines would be necessary, the news spread with incredible celerity through the cars that the train would be held at that place till further orders, which was interpreted by the staff as indicating a probable stay overnight. The engine that should have taken "No. 1" on the final stage of its long run had just left, hauling a freight caboose, to investigate the conditions obtaining at a point about 13 miles ahead, where a trestle was reported to be burning.

In an endeavour to quell the irritation arising from this last disappointment, it was announced that a dance would be held later in the evening in an empty house on the hillside. The spot is a romantic one. To the left the mountains rise close to the railway; on the right, a steep bank leads down to the Fraser River, rushing



KAMSACK STATION: WHERE THE PARTY WAS "LEFT."

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with great velocity to its tortuous passage of the famous Hell's Gate, a few miles below. On the opposite shore runs the rival transcontinental railway, backed again by more mountains. It was now about 6 p.m. and the passengers, glad of the opportunity of stretching their legs, were quickly dispersed in all directions, some gathering wild flowers and berries, others descending to the water, whose coolness proved very refreshing after the heat of the train.

However, the era of surprises was not yet over. A number of shrill blasts on the engine whistle summoned the scattered travellers, and in a very short time the journey was being retraced eastward, the young conductor of one's particular car appearing quite depressed at the cancellation of the dance. From 8 p.m. till midnight the backward progress continued, covering a distance of 68½ miles, with a stop *en route* to reverse the engine on a turning "Y."

For the next two hours one had an opportunity of watching passenger and freight trains passing in both directions on the Canadian Pacific Railway, whilst awaiting transfer to that company's line. This having at length been effected, and once more headed west, the canyon was again followed for 111 miles, but mainly on the opposite side to that previously traversed, until a re-transfer to the Canadian National Railways took place at a junction suitably named "Hope." Departing from here at 7 a.m., the time of a local passenger train was kept into Vancouver, which was reached at 11 o'clock, or 16 hours behind schedule.

For most of the travellers the long trip thus came to a successful conclusion on the fourth morning following the start, in spite of disturbing suggestions that arrival at each divisional point would find no crew to carry on to the next stage. The writer, however, started off again from the same station at 3 p.m. in search of further adventure, but this time in a Great Northern Railway train bound for Washington, the "Evergreen" State. But this constitutes another tale that has no manner of concern with "A Striking Railway Journey."

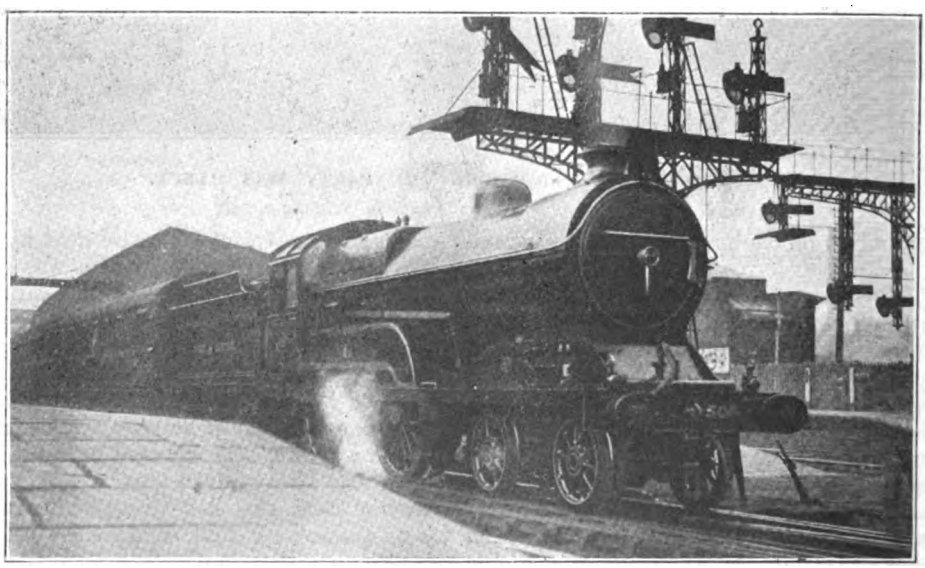

Photo.] [*W. H. Whitworth.*

GREAT CENTRAL RAILWAY.

New 4-4-0 Locomotive No. 506 "Butler-Henderson" at Guide Bridge.

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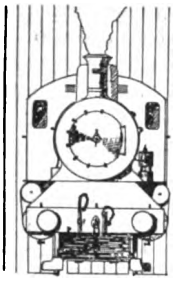
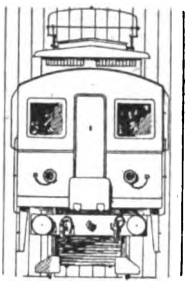


The Railways of the Bernese Oberland.



By Donovan H. Lee.

ALMOST in the centre of Switzerland and separated from the rest of the Alps by the river Aar and the river Rhône the Bernese Alps derive their name from the little canton of Berne, upon the northern slopes of the watershed. Perhaps only eclipsed by the lonely Matterhorn for mountain grandeur, this part of Switzerland is the most attractive objective for the tourist. This district is, too, the most accessible of all the Alps, being served by several persistent winding mountain railways which never seem to give up hope of eventually arriving at one of the summits.

Interlaken is the tourist centre of the Oberland, although Thoune and Brienz are competitors. These towns are on the northern side. From the south the range is less accessible. The *funiculaires* and rack railways of the northern side meet most requirements.

Of the standard railways in the Oberland the Loetschberg line, since its opening in July, 1913, is by far the most important. It is electrically operated, and forms part of the Bernese Alps Railway connecting the capital of Switzerland, Berne, with the Simplon Tunnel and Italy. Previous to this line being constructed, the only route from Central and North Western Switzerland to the Simplon was via Lausanne and the Rhône Valley, a considerably longer route.

The Bernese Alps Railway itself commences at Thoune and terminates at Brigue, at the Swiss end of the Simplon Tunnel, crossing the watershed of the Oberland by means of the Loetschberg Tunnel. For the first seven miles to Spiez, the line follows the lake side of the Thunersee from Thoune. A short distance from Spiez, however, it curves off sharply to the south, and begins to ascend in the Hondrich Tunnel, 1,600 metres, or almost exactly one mile, long, and on a gradient of 5·5 per 1,000.

Mulenen, 6·8 kilometres from Spiez, is the starting point of the Niesen Funiculaire. This little line, like nearly all *funiculaires*, denotes its presence for miles around by the straight gash it makes up the mountain side. The Niesen is, notwithstanding, a pretty mountain. The summit is 2,360 metres (6,770 ft.) above sea level.

At Frutigen, 13·5 kilometres from Spiez, the Loetschberg line leaves the left bank of the Kander and crosses to the east. Frutigen was for several years the terminus before the tunnel was built. It is a quiet little town, built mostly of stone to avoid the continual fires which destroyed the town in the late middle ages. It would seem that it had been overlooked since the seventeenth century, and just recently discovered by the construction of the railway.

A short way higher up the valley, near to the starting point of the spirals by which the Loetschberg Tunnel is reached, is the little Blausee (Blue Lake), well known for its beauty. The water of the lake is exceptionally clear. Its name is probably derived from the reflection of the sky in the lake.

On the opposite side of the valley the line passes by this lake three times, as it winds about, to change altitude. The whole length throughout the ascent from Spiez is uphill, and at an average gradient of 17·4 per 1,000. After crossing the Bietschal viaduct, Kandersteg is reached. Here the line enters the great Loetschberg Tunnel, 14·61 kilometres or 9·1 miles long. At the other, or southern end of the tunnel is Goppenstein.

From Goppenstein down to Brigue, the junction for the Simplon line, the gradient averages 20·7 per 1,000, or

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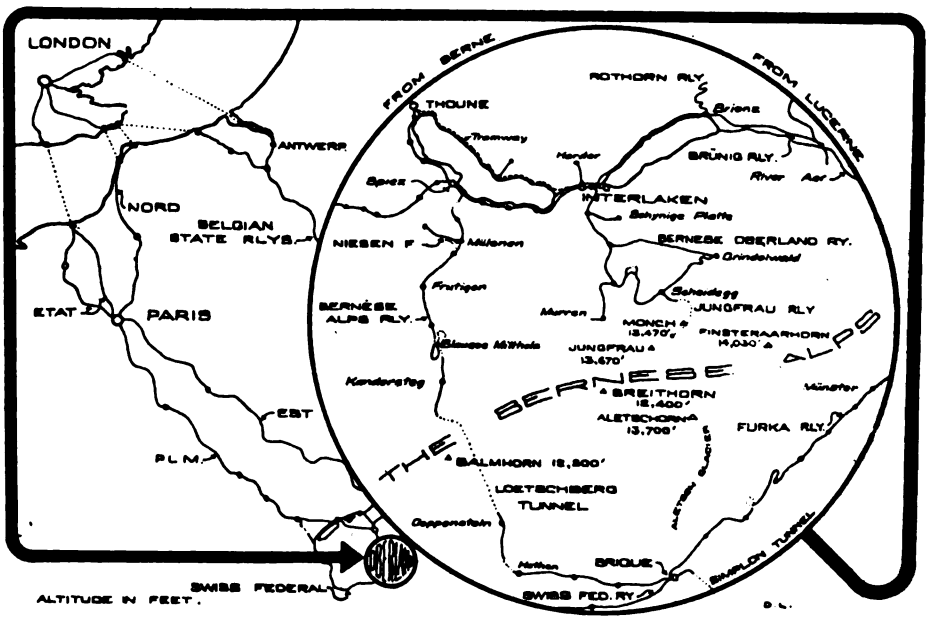
1 in 48·3. The maximum gradient at any part of the line is 27 per 1,000, which is equal to 1 in 37. Seeing that the length of the line from Spiez to Brigue is 74·5 kilometres, and considering the steep gradients, it is apparent that a tremendous amount of work is done against gravity by each train that climbs to the main tunnel.

Besides the Loetschberg Tunnel itself, there are 34 other tunnels and numerous bridges. Stations are externally more like hotels than stations, and they are most picturesque. For permanent way the Bernese Alps Railway is not behind

The locomotives are of several classes. The earlier type has the 0-6-6-0 wheel arrangement, and is capable of developing 2,000 h.p., the motors, two in number, being geared and coupled to the driving-wheels by means of connecting-rods. There are also 2-4-4-2 locomotives, and a 2-10-2 type which develop 2,500 h.p., more powerful than any steam engine in Europe. This latter type have both motors geared to single coupling rods on each side. Tractive effort at the draw-bar is 10,000 kilogrammes, or 22,046 lb., with a maximum allowed speed of 75 kilometres per hour. By contract these



RAILWAYS OF THE BERNESE OBERLAND.

English lines. In and near the tunnels the track is of bull-headed chaired rails, which is more or less unusual on the Continent. Other parts of the line are of the usual flat-bottomed rails. Severe curves are the rule, the minimum radius being 300 metres or 14 chains, and 17 per cent. of the entire length of the line is at this radius. To allow for this, the end pony-truck wheels and centre wheels of the electric locomotives are given extra side play. Current is supplied by overhead wire, and is at 15,000 volts. It is single-phase alternating, as in the St. Gothard electrification, and at a frequency of 15 cycles per second.

locomotives had to be able to haul a 310-ton (metric) train at 50 kilometres per hour up the maximum gradient of 27 per 1,000.

Besides the before-mentioned electric locomotives, there are some electric rail-motors fitted with two 225 h.p. motors. These cars are used for the local services, and seat 64 persons. The trolley wire in the open is 6·7 metres above rail level, but in the tunnels, owing to the restricted head room, it is only 4·80 metres above.

In the case of the 2-10-2 locomotives, each motor develops 1,250 h.p. operating under 500 volts with a maximum current intensity of 3,000 amperes.

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The only two power stations on the line are at Spiez and Kandergrund, the normal power generated being, in kilovolt amps., 2,500, and 2,700 respectively. The line is single track throughout, with the exception of the Loetschberg tunnel. This was one of the conditions to obtain the subsidy for the construction of the line. The summit of the line, which is on this section, is 1,243 metres above sea level, or almost as high as the summit of Ben Nevis. The range above the tunnel, at the Loetschen pass for instance, is 2,695 metres above sea level, or 8,800 ft. The Balmhorn, quite near here, is 12,200 ft. high.

GOPPENSTEIN STATION, AND PORTAL OF THE LOETSCHBERG TUNNEL (9·1 miles long).

From these immense heights a panorama of most of Switzerland can be obtained. From the Chasseral, in the Swiss Jura, the Jungfrau, one of the summits of the Oberland and 13,670 ft. high, can be clearly seen against the sky line, with the Monch and Eiger, a distance of 61 miles. The higher one climbs on any other mountain the higher the range seems to tower until on the summit, say, of the Niesen, one realises the tremendous height and grandeur of the main range. A sunset reflecting the red rays on the snow gives a pink tint to the mountains which is wonderfully pretty, and then only do the mountains lose their mysterious calm and serenity. The only way of reaching these summits, except by days of mountain climbing, is by the Jungfrau Railway from Scheidegg on the Bernese Oberland Railway. The Jungfrau Railway, which is mostly in tunnel, operates a service of six trains a day each way, to and from Jungfraujoch, 3,400 metres above sea level.

Jungfraujoch is midway between the Monch and the Jungfrau, two of the highest summits of the Oberland. There is also one extra train in the evening to the Eiger Glacier only, and two in the morning from there to Scheidegg. From Jungfraujoch or Eismeer stations mountaineers can reach the other summits. The Finsteraarhorn, the highest mountain in the Oberland and 14,030 ft. high, is 8 kilometres from Eismeer station.

The Jungfrau Railway is electrically operated by small four-wheel locomotives. Current is three-phase, and is collected by two trolley arms on each locomotive. Scheidegg, the starting point of the line, is served by the Wengernalp line. This line, which connects with the Bernese Oberland Railway, is 0·8 metre gauge.

Interlaken Ost (East) Station is the junction for the Berner Oberland line, the Brünig Railway, and the normal gauge

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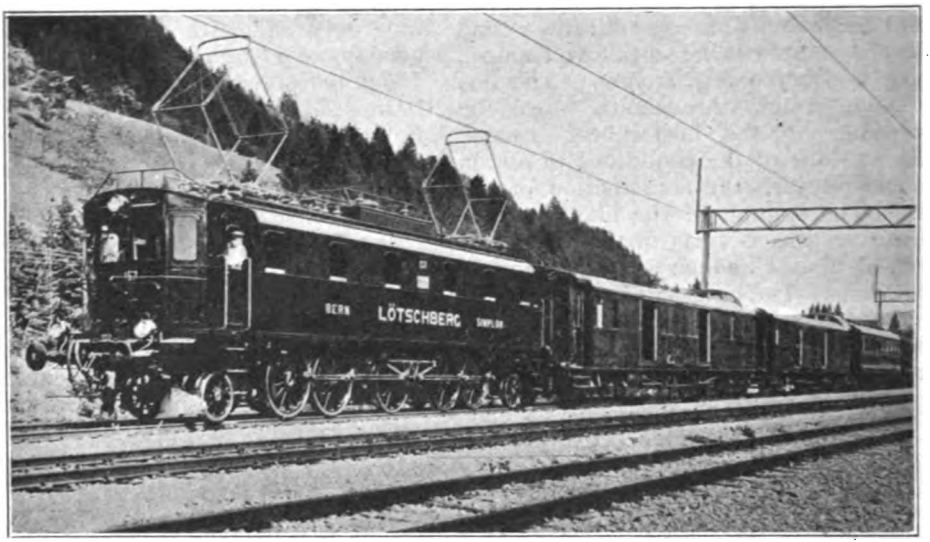

LOETSCHBERG ELECTRIC LOCOMOTIVE AND TRAIN AT MÜLENEN.

from Spiez. The Brünig Railway, which is also metre gauge, starts from Lucerne, and is steam operated. The section by the Sarner-See is rack, but from Meiringen to Interlaken it is worked by 0-6-0 tank locomotives which have Walschaert valve gear and the four cylinders outside superimposed in pairs. This line was described in the February, 1912, RAILWAY MAGAZINE before the Brienz-Interlaken section had been constructed. It is part of the Swiss Federal system.

At Brienz there is also the Rothorn Bahn, a 4¼-mile line to the Rothorn Kulm. Trains leave Brienz and Rothorn Kulm twice daily. Although the fare is the "modest" one of 8 francs (plus about 35 per cent.) upwards, it is perhaps worth it, as the vertical rise is to 7,720 ft. above the sea level.

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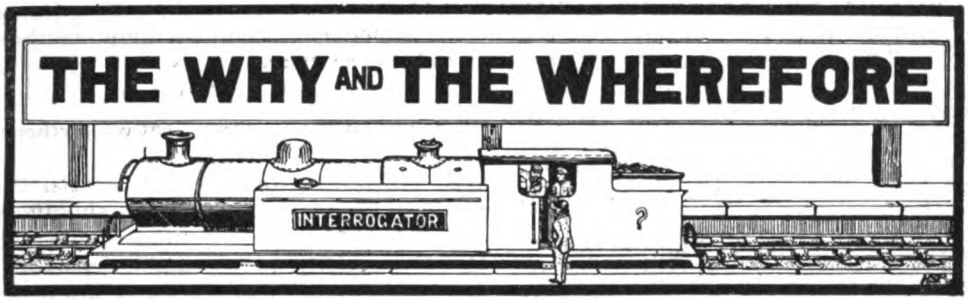

RAILWAY MAGAZINE readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to locomotive sheds and to the dimensions of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. Queries respecting British Locomotive Practice and Performance should be sent to Mr. Cecil J. Allen, c/o RAILWAY MAGAZINE, 30, Fetter Lane, Fleet Street, London, E.C.4. Queries should not be of purely local interest. No reader should forward more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history and the like, readers should consult the pages of the "Railway Year Book," for the current year. Price 5s. By post 5s. 9d.

"Claughton" Class 4-6-0 Engines, London and North Western Railway.

A total of 70 of these engines was on order to be built during the present year, but owing to strike and other difficulties this number is not likely to be realised. With the 60 "Claughtons" already built and running the number in service at the present moment is in the neighbourhood of 90. For particulars of exceptional running by these engines you should refer to Mr. Cecil J. Allen's articles in January, 1914, February, 1915, and January, 1916. With the exception of No. 1,914, *Patriot*, the new engines are not receiving names. "George the Fifth" class 4-4-0 engines total 90, and, in addition, a considerable number of the "Precursors" have now been superheated, and rank as of equal tractive capacity with the "Georges."

[Reply to H. WAIGHT.]

Engine Sheds, Midland Railway.

By courtesy of Mr. J. H. Follows, General Superintendent, Midland Railway, we are able to meet the desires of many readers as follows: (1) Derby; (2) Buxton; (3) Birmingham; (4) Worcester; (5) Brecon; (6) Upper Bank; (7) Gloucester; (8) Bristol; (9) Peterborough; (10) Leicester; (11) Wigston; (12) Kettering; (13) Wellingborough; (14) Bedford; (15) Cricklewood; (16) Kentish Town; (17) Toton; (18) Nottingham; (19) Liverpool; (20) Buxton; (21) Manchester; (22) Westhouses; (23) Hasland; (24) Staveley; (25) Sheffield; (26) Normanton; (27) York; (28) Leeds; (29) Bradford; (30) Skipton; (31) Carnforth; (32) Lancaster; (33) Carlisle.

[Reply to "OWENORA," E. V. ARON and others.]

South Eastern & Chatham Railway Continental Boat Trains.

At the time of writing the boat train schedules (which are subject to constant alteration) are as follows:—From Victoria: 8.10 a.m. Paris—arr. Folkestone Junction, 9.57 a.m., Harbour, 10.5 a.m.; 8.20 a.m. Ostend—arr. Dover Marine 10.15 a.m. (the foregoing travel *via* Bickley and Orpington); 11 a.m. Paris—arr. Dover Marine 12.55 p.m., *via* Chatham; 12.45 p.m. Ostend—arr. Dover Marine 2.55 p.m.; 4.15 p.m. Paris—arr. Dover Marine 6.15 p.m.; 9 p.m. from Charing Cross for Flushing, arr. Folkestone Junction 10.38, Harbour 10.47 p.m. All the up boat timings are regarded as "conditional," and are too numerous to mention.

[Reply to T. C. ADKINS.]

Tractive Effort.

It is assumed, as a result of experiment, that steam in its passage from the boiler to the cylinders loses on the average 15 per cent. of its pressure, and the tractive efforts are, therefore, calculated usually at 85 per cent. of the working pressure. Tractive efforts of the classes to which

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you refer are as follows:—South Eastern & Chatham Railway: Large-boilered 4–4–0's, "772" series, 18,575 lb.; "E" class 4–4–0's, 17,950 lb.; 0–4–4 tanks, 16,965 lb. London and South Western Railway: Rebuilt 6 ft. 7 in. 4–6–0's, "443" series, 22,030 lb. The latter weigh in working order 75¾ tons without, and 136¼ tons with, tender.

[Reply to C. C. and "HAMPTONIAN."]

Highest Point on Caledonian Railway.

By the courtesy of Mr. R. Killin, superintendent of the Line, Caledonian Railway, we are able to give the heights of the summits at Beattock (1,014 ft.), Wanlockhead (1,402 ft.) and Leadhills (1,405 ft.) above sea level. It is pointed out, however, that the Leadhills and Wanlockhead line is a light railway, so that the RAILWAY YEAR BOOK correctly describes Beattock summit as the highest point on a main route or a standard part of the Caledonian system. The summit level on the Highland Railway, between Dalwhinnie and Dalnaspidal, is 1,484 ft. above sea level.

[Reply to A. A. TORRANCE.]

Colwall Tunnel, Great Western Railway.

This tunnel, between Malvern Wells and Colwall on the Worcester and Hereford line, has a length of 1,395 yards, and is on an ascending grade of 1 in 80 from Malvern direction. It was opened for traffic in 1861. The Worcester and Hereford Railway was constructed originally as a single line, and although all this section except this tunnel and the 1,200-yard tunnel east of Ledbury has since been doubled, we presume that the expense of doubling these two long tunnels is not considered as justified by the amount of traffic passing over the route.

[Reply to R. H. H.]

"Rule 55 Exempt."

This visible indication on advanced starting signals on the Lancashire & Yorkshire Railway is to show that the fireman of a train detained for some time at such a signal is not required to proceed to the signalbox in order to remind the signalman of the continued presence of the train concerned in his section. The reason for the exemption is generally that the section in question is track-circuited, in which case the presence of the train itself on the line electrically controls signals which might admit another train into the same section.

[Reply to W. R. P. L.]

Platforms at King's Cross, Great Northern Railway.

In order, left to right, looking north: platform A, platform B, down suburban (through from Metropolitan Railway), C, D, E, No. 1 down main departure, No. 2 down departure, No. 5 up main arrival (the other face of No. 2 departure), No. 4 arrival (a short platform), No. 3, let into No. 4 where the latter is cut away, No. 2 arrival, No. 1 main line arrival, and (outside the main station) York Road, used for up suburban trains going through to the Metropolitan Railway.

[Reply to E. J. WROTTESLEY.]

Great Western Railway Valve-Gears.

A special form of Walschaert gear, inside the frames, is adopted for four-cylinder express engines on this railway, while link-motion is used for the two cylinder classes. In the case of the four-cylinder engines two sets of motion only are provided, applied directly to the valves of the inside cylinders, and to those of the outside cylinders by means of cross-levers having two arms, and fulcrumed at about the centre of the main engine frames.

[Reply to "RUGBEIAN."]

London and North Western Railway Locomotive Lists.

Complete classified lists of all engines on this railway, with names of all named engines, and leading dimensions of all classes, are published by Mr. C. Williams, of 73, Chetwode Street, Crewe. The main list, dated 1912, is priced at 1s. 6d., and the supplementary list, correcting the former up to 1918, at the same figure. We are unable to explain the "roaring" propensities of the 4–4–0 engine *Fame* to which you refer.

[Reply to "CLAUGHTON."]

American Locomotives on the Great Central Railway.

At a time of locomotive shortage, in 1900, the Great Central, as well as the Midland and Great Northern Railways, bought from America a number of 2–6–0 or "Mogul" engines for goods service. G.C.R. No. 963, to which you refer, was

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one of this series. The engines were not rebuilt, and so had a comparatively short life before being broken up.

[Reply to J. V. HALL.]

Locomotive Districts, Great Northern Railway.

(1) Doncaster, (2) Peterborough, (3) King's Cross, (4) Colwick (Nottingham), (5) Ardsley (Leeds), (6) Bradford, (7) Grantham, (8) Lincoln, (9) Retford, (10) York, (11) Manchester. Your second query is out of order. Most of the superheater engines have the snifting valves you mention, but we cannot undertake to give lists of locomotives.

[Reply to G. CHRISTY.]

Liverpool-Hull Express Services.

Following expresses on the London and North Western Railway north-east route are worked through to and from Hull by London and North Western engines :— 10.40 a.m. and 3.35 p.m., Liverpool to Hull, and 9.5 a.m. and 4 p.m., Hull to Liverpool. Fastest pre-war time by Lancashire and Yorkshire route between Liverpool and Hull was 3 hrs. 3 min., by the 2.10 p.m. from Liverpool.

[Reply to L. P.]

"Last Vehicle" Boards.

Red boards with the letters "L.V." are used on the London, Brighton and South Coast Railway to indicate the end of a train, instead of depending upon the tail lamp as information to signalmen that the whole of a train has passed. This information was given quite recently, as also an answer to your other query in regard to track circuit indicators on signal posts.

[Reply to A. W. PUTTOCK.]

Broken Couplings.

It would be obviously impossible for couplings to break while they are "slack." Probably in the case you mention a loose-coupled train was standing on a descending gradient with buffers compressed when the engine started away too rapidly, with the result that the "snatch" as each coupling was suddenly tightened caused one of them to break.

[Reply to GEORGE ROBINSON.]

New London, Brighton and South Coast Railway Locomotives.

We understand that five new 4–6–4 express tank engines and five new 2–6–0 locomotives are under construction, and some of the latter should very soon be in service, but we cannot anticipate the intentions of the authorities and, speaking generally, queries of this class cannot be dealt with in future.

[Reply to G. de C.]

Continental Trains, South Eastern & Chatham Railway.

Doubtless you refer to the Victoria—Dover Continental service. This and others are usually limited to first and second-class passengers, to agree with arrangements on the other side of the Channel, but if there is a third-class service, appropriate vehicles are, of course, included.

[Reply to J. WROTTESLEY.]

No. 103, Great Western Railway.

This is one of three engines, No. 102 *La France*, 103 *President* and 104 *Alliance*, purchased from the Alsatian Works at Belfort for trial of the de Glehn compound system. Originally they were entirely of French design, but new boilers have partially anglicised them. All have the Walschaert valve gear. No other railway has adopted this design here.

[Reply to A. J. GUSH.]

Signals at Rugby.

The short signal arm to which you refer is probably a "draw-ahead" signal, which, when lowered, allows a train to draw ahead in certain special circumstances past a stop signal at danger. The stop signal is found above the draw-ahead arm. Your sketch is not sufficiently clear for us to identify the other signals referred to.

[Reply to "METEOR."]

Midland Railway (London, Tilbury and Southend Section) Locomotives.

Particulars of the 4–6–4 tank engines were given, with diagram, in the September, 1912, RAILWAY MAGAZINE, and with a photographic reproduction in June, 1913. Several illustrations showing these engines on trains have also appeared. Neither of the issues above mentioned are now in print.

[Reply to A. N. O. N.]

"Atlantic" No. 271, Great Northern Railway.

This is the only 2-cylinder "Atlantic" with inside cylinders on the system. It

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was built by Mr. Ivatt in 1902 as a 4-cylinder simple engine with cylinders 15 in. by 20 in.; in 1911 he rebuilt it with two inside cylinders only, 18½ in. diam. by 26 in. stroke. At the same time superheating equipment was added.

[Reply to H. L. SALMON.]

Great Northern Railway, Enfield-Stevenage Loop Line.

This will doubtless be opened for passenger traffic as soon as a double line has been laid and the signalling and stations are completed. It is unlikely, however, that any of the principal expresses will be worked by this route in view of the heavy grading, service slacks and extra distance.

[Reply to "G.N.R. ENTHUSIAST."]

Locomotive Comparisons.

Overall length of the Great Western Railway *Great Bear*, is 71 ft. 2¼ in.; of the Great Western Railway "Star" class, 4-6-0's, 64 ft. 1¾ in.; and of the London and North Western "Claughtons," 63 ft. 4¾ in. All three types conform in height and width to the loading gauges of the two railways, for details of which see the RAILWAY YEAR BOOK.

[Reply to S. WESTWOOD.]

New Rolling-Stock, London & South Western Railway.

Presumably you have seen some of the latest vehicles constructed at Eastleigh; and which naturally include any changes or developments in general construction. We understand that no new classes of particular interest have been added.

[Reply to R. A. HARDY.]

Through Working of Goods Brake-Vans.

It is becoming a frequent practice, where complete goods trains work through from one system to another, to work the brake-vans through with them, and the Great Western Railway brake-van you have seen on the London, Brighton and South Coast Railway was doubtless working through in this way.

[Reply to "BUFFER."]

Rebuilt 4-4-0 Engines, South Eastern and Chatham Railway.

Nos. 497 and 504 are superheater rebuilds to form the class of which No. 179 was illustrated and described in the February, 1920, RAILWAY MAGAZINE. They are designed for service on routes where the large 760 class are not allowed.

[Reply to "KENT COASTER."]

Engine Working, Great Western Railway.

It depends upon the number of engines in the "links" or series of engines whose "turns" include the 10·30 a.m. ex Paddington, as to how often a particular engine will take this train, and this may be modified by special conditions which may arise.

[Reply to A. J. GUSH.]

"Cornwall," London and North Western Railway.

Presumably you saw this old engine working the chief mechanical engineer's private saloon, a duty for which it is regularly employed. It is, we believe, the oldest locomotive now in service, though there are a few others which approach its record.

[Reply to G. B. B.]

Air Brakes on Electric Trains.

Whereas on a steam locomotive air for the Westinghouse brake is compressed by a steam-operated pump, or exhausted by means of an ejector to create vacuum, on electric trains an electrically-operated compressing pump or exhausting fan is used to obtain the same results.

[Reply to W. H. SHAW.]

Colours of Rolling-Stock.

Caledonian Railway, main line carriages: lake bodies with white upper panels; branch trains: lake. Glasgow and South Western Railway, passenger carriages: crimson lake. See RAILWAY YEAR BOOK for information of this class.

[Reply to J. W.]

The Largest Six-Wheeled Tender.

There are no larger capacity six-wheeled tenders in this country than those of the North British Railway "Atlantic" express engines, which take 4,240 gallons of water and 7 tons of coal, and weigh in working order 45½ tons.

[Reply to E. C. J. S.]

London and South Western Railway Safety Valves.

Safety valves employed on the "463" series 4-4-0's are of the ordinary Ramsbottom type, but are mounted on the

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dome instead of the firebox in order to reduce the number of openings in the boiler shell.

[Reply to A. P. IVES.]

4-4-2 Tank Engines, Midland Railway.

These number 70 in all, and were taken over from the London, Tilbury and Southend Railway when that line was acquired by the Midland. The 4-4-2 tanks still work exclusively on the L.T. and S. section.

[Reply to R. M. K.]

South Eastern and Chatham Railway Gradients.

Principal main line gradients of this railway are given in Mr. Cecil J. Allen's article elsewhere in this issue. The four tracks on the Tonbridge main line converge to two at Orpington.

[Reply to T. M. LEWIS.]

2-2-0 Locomotives, London and South Western Railway.

These small engines, designed in 1906 by Mr. Dugald Drummond for working "motor-trains," have 10 in. by 14 in. cylinders and 3 ft. driving wheels, the leading wheels being uncoupled.

[Reply to W. I. PEARKS.]

North Western State Railways, India.

The line you mention, extending from Quetta into Persia, is operated in conjunction with the North Western State Railways of India. No other particulars are available.

[Reply to P. H. S. DREW.]

Four-cylinder Compound 4-6-0 Engines, London and North Western Railway.

This class originally consisted of 30 engines, but at the present time the number of survivors is reduced to one only.

[Reply to "METEOR."]

The Largest Great Northern Railway Signal Box.

King's Cross West, with 140 levers. For information of this character consult the RAILWAY YEAR BOOK.

[Reply to R. T. NINNIS.]

Snape Branch, Great Eastern Railway.

This is similar in character to many goods branches in different parts of the country, and is not suitably signalled for passenger working.

[Reply to R. T. NINNIS.]

Midland Railway Locomotives.

Large Midland 0-6-4 tank engines Nos. 2000-2039, and the small 0-4-0 shunting engines numbered 1528 to 1532, were designed by Mr. R. M. Deeley.

[Reply to "SINGLE-WHEELER."]

Weymouth District Lines, Great Western Railway.

There is a double line throughout from Yeovil to Weymouth, but the branch from Upwey Junction to Abbotsbury is single.

[Reply to "RUGBEIAN."]

Through Coaches to Liverpool, Midland Railway.

From St. Pancras through carriages run to Liverpool (Central) on the 10.15 a.m. train.

[Reply to "R. M. K."]

Stations in Liverpool.

Exchange Station (Lancashire & Yorkshire Railway) and Lime Street (London & North Western Railway) are a little under three-quarters of a mile apart.

[Reply to H. WAIGHT.]

Engines Building at Eastleigh, London and South Western Railway.

We understand that 4-6-0 and 4-8-0 type tank engines are under construction for goods service.

[Reply to "HAMPTONIAN."]

Great Eastern Railway Locomotives.

The only special indications are the numbers of the districts to which engines belong, on small triangular plates attached to the cab roof.

[Reply to E. J. PEARCE.]

Highland Railway Locomotives.

4-4-0 engine No. 72 *Loch Ruthven* was rebuilt in 1917. Nos. 82A (unnamed), 83A *Monkland* and 84A *Dochfour* are old 4-4-0 locomotives.

[Reply to E. LE Q. HERBERT and others.]

Slip Coaches on Great Central Railway.

A slip coach for Brackley is attached to the 6.10 p.m. express from Marylebone to Bradford; this is the only one at present running on the Great Central Railway.

[Reply to "G.C.R. ADMIRER."]

Glasgow, Yoker and Clydebank Railway.

This line was incorporated in 1878 and opened not long after. It was amalgamated with the North British Railway in 1897.

[Reply to J. WOTHERSPOON.]

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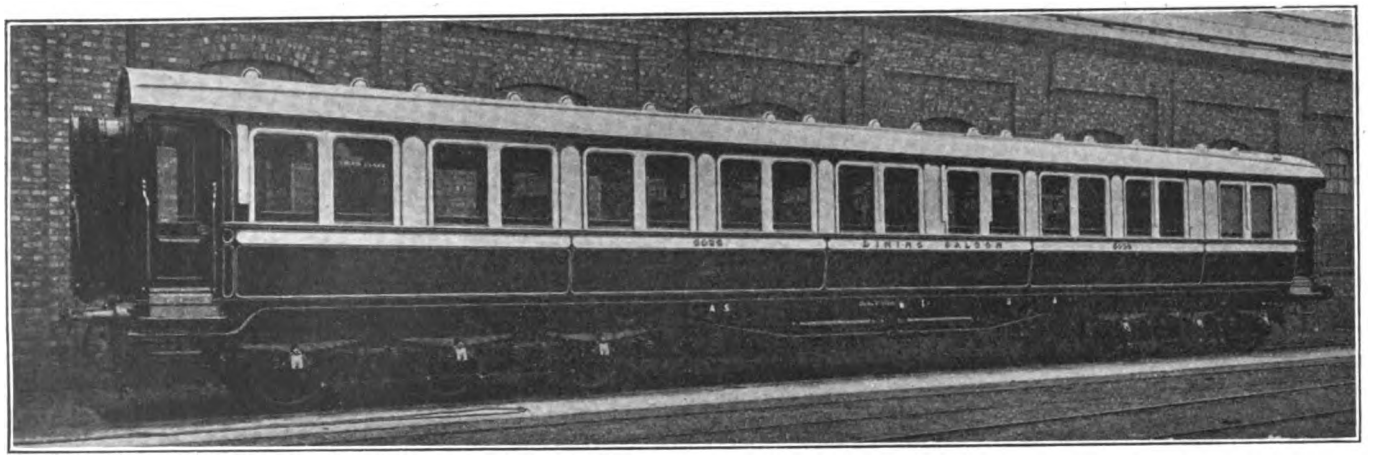
New Third-Class Restaurant Cars.

LONDON & NORTH WESTERN RAILWAY.



DESIGNED by Mr. A. R. Trevithick, C.B.E., Carriage Superintendent, London and North Western Railway, some new third-class restaurant-cars have been constructed at Wolverton, and are now being placed in service.

They have vestibules at each end, and the seating space is divided into two main compartments, one for 18 and the other for 30 passengers. There is also a butler's pantry, though meals will be served from an adjacent car containing a kitchen. The smaller compartment is upholstered differently from the larger one, so that it can be used, if desired, as first-class accommodation.

These cars are carried on six-wheeled bogies having rolled-steel disc wheels. A gas supply is carried for heating purposes, fitted with automatic safety control, but lighting is electric. The body framing is of oak and teak, panelled in Honduras mahogany. Seats are of chair type, single or double, on either side of a passage-way. Lighting is by "four-light" bowl fittings with opal shades under the ceiling, with side bracket lamps individually controlled over each table.

Principal dimensions are :—

Length over buffers	72 ft.
,, ,, body	68 ft.
Centre to centre of bogies	45 ft.
Bogie wheelbase	12 ft. 6 in.
Width of body at waist	9 ft.
Approximate weight (empty)	42 tons.

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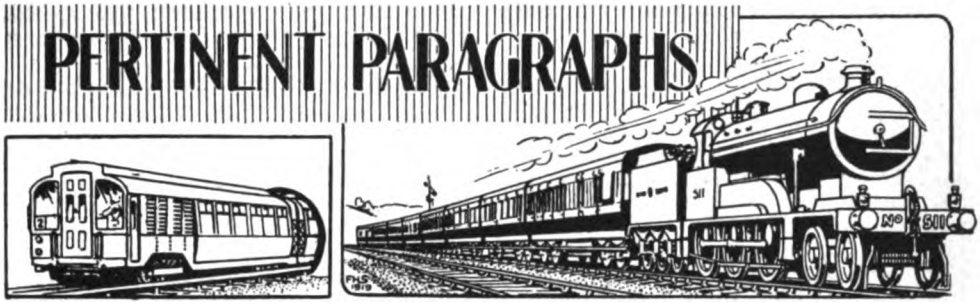
PERTINENT PARAGRAPHS



4-4-4 Express Tank Engine, Metropolitan Railway.

To meet the growing needs of traffic on the extension line to Aylesbury, and in view of the addition of new heavy rolling-stock for the principal trains, eight locomotives having the 4-4-4 wheel arrangement are being placed in service on the Metropolitan Railway. Designed by Mr. Charles Jones, Chief Electrical and Locomotive Engineer, they have been built by Kerr, Stuart & Co., Limited. The first of them has been placed in service, and a photograph is reproduced as frontispiece to this number of the RAILWAY MAGAZINE.

The route over which these engines are to work includes many steep gradients, so that an average train load of about 250 tons calls for considerable power capacity, particularly as the trains are smartly timed, even where they call at every station. There are also numerous severe curves on the main lines, and the engines are required to be able to take curves of 4½ chains radius in the yards and sidings.

The dimensions of these locomotives approximate to those of engines designed for heavy main line service, and they should be capable of running at the highest speeds required. The boiler is provided with a firebox of Belpaire type, and is equipped with Robinson superheater with elements connected to the header casting by means of flanged joints. The valve gear is of Walschaert type operating 10-in. internal admission piston valves. Fittings include Wakefield mechanical lubricator, Gresham & Craven injectors, steam sanding and other usual equipment. The 4-4-4 wheel arrangement is particularly suitable for engines which are required to work with equal efficiency in either direction without turning.

Over-all length over buffers is 41 ft. 10½ in. with a total wheelbase of 3 ft. 6 in., rigid wheelbase 7 ft. 9 in., bogie wheelbase 6 ft. 6 in. The adhesion weight of 39 tons on coupled wheels gives a calculated tractive force of 17,411 lb. at 80 per cent. boiler pressure and 446 lb. per ton of adhesion weight, a figur designed to give quick starting. The outside cylinders are slightly inclined. The boiler has a barrel of 5 ft. diam. and 11 ft. in length, containing 147 tubes 1¾ in. outside diam. and 18 superheater smoke tubes 5½ in. diam. The side and end tanks have a combined capacity of 2,000 gallons and the coal bunker contains 4½ tons of fuel.

The following are the leading dimensions :—

Cylinders	19 in. by 26in.
Coupled wheels, diam... ..	5 ft. 9 in.
Bogie wheels, diam.	3 ft.
Steam pressure	160 lb. per sq. in.
Heating surface in tubes ..	765 sq. ft.
Heating surface in flue tubes ..	281 sq. ft.
Total tube heating surface ..	1,046 sq. ft.
Heating surface in superheater elements	268 sq. ft.
Heating surface in firebox ..	132 sq. ft.
Total heating surface	1,446 sq. ft.
Grate area	21·4 sq. ft.
Weight of engine empty ..	61 tons.
Weight of engine in full working order	77 tons.

Railway Education and Training.

ADDRESSING the members of the Institute of Transport as the new President, Lord Ashfield dealt with this subject, and, as usual, much that he said is worthy of careful study and consideration. In introduction he led up to his main subject by a brief review of what transport really is, and how mechanical traction has changed the world in almost every vital particular.

"Because it involves specialised knowledge, transport is spoken of as a science and is taught as a separate subject. Yet transport is not a science so much as the practical application of many sciences to the solution of a special type of problem. There enters into transport: engineering in all its branches, civil, mechanical, electrical; economics in its most liberal extension; statistics and the imaginative treatment of figures; psychology in its modern social implications. There come in as well those descriptive sciences—law to govern our actions; geography,

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natural, commercial, and physical. All these establish principles of which transport affords illuminative illustrations in practice. What we have to seek, therefore, is not the setting up of a science of transport, as though it were a thing apart, but the drawing upon all science to enrich our comprehension and knowledge of transport as a fact. Our aim must not so much be to convey a mass of specialised information as to educate the faculties to find out and use well the specialised information that flows in upon us in our daily tasks. Our aim must be to ensure that every approved scientific method is fitly applied to transport.

"And by scientific methods I am not thinking of the scientific management which has been exploited in America, and which is now spreading over here. I am not thinking of merely securing a greater practical efficiency in detail, of getting the greatest results out of the least effort, excellent as all that may be in its proper place. I am thinking of the way in which problems of management should be tackled, not by trial and error, not by guesswork, not by slow and tentative adjustments, but by the knowledge gained from ordered experience. A knowledge which must be gained by a wide survey that gives to everything a true perspective."

Plain Speaking.

REFERENCE was then made to the work of the railway sections of the London School of Economics, and the training and educational possibilities of the Institute of Transport, followed by outspoken comment upon the past attitude of railway management and the great change which was now in evidence. "The principal railways of the country are beginning to be alive to the need of thorough training in this knowledge. Twenty years ago they hardly cared. To some, what had been good enough in the past was good enough now. Success had spoiled them to an over regard for their attainment. In all commercial and operating matters the rule of thumb was the standard of management, even as the Chancellor's foot was once the standard of equity in the Courts. The railways had the good fortune to enlist in their service great practical geniuses, and became prosperous and expansive. These men were the exception. The rank and file toiled along in a routine way, knowing little except the task before them, and performing that year in year out in a perfunctory way, without change or improvement, except of a minor character. Given right education, this could not continue, healthy unrest must burst into the offices. Such education cannot rob us of our geniuses, and it will lift the rank and file to a more intelligent use of their faculties, and so bring up the work to a higher general level of attainment."

Then followed some useful comments upon the work of the Institute of Transport; and Lord Ashfield continued: "Transport just now is not a very profitable affair, but because of its necessity we can have a firm hope that that will quickly right itself, and it must not deter us from being prepared. Transport must afford to educate its youth. The large companies and undertakings must be prepared to second their promising recruits, paying not only the fees but a generous subsistence allowance. Maybe, through this Institute, we may rid our previous individual efforts in this direction of their selfishness. We may aim at education and not at more efficient clerking, to the end that we may attain an accomplished member, an ornament of the Institute, as well as an accomplished officer, the joy of his company.

"An engineer spends five years on his training. A doctor spends six years in preparation for his career. Both have three years of general education in arts and science, and, after that, two or three years of special education in the practice of their calling under educational conditions Nothing less must serve us."

Systematic Training of Railwaymen.

"I turn again to speak especially of railways because they are large elaborately organised corporations. Their organisation is usually on a departmental basis, and often the departments are watertight. A man gets into a department, and there he sticks. He sees before him a narrow avenue of promotion. The more fitted he becomes to perform his own job the more difficult he may find it to get out of that job. Even within a department promotion is sometimes confined to the petty hierarchy of the staff in some section of it. We have to ask ourselves whether this is right. We might even ask ourselves whether from a selfish point of view, this pays the company. Some of the failures in our offices are caused by the impossibility of putting straight a bad start. Only by shifting from post to post can the capacity of a man be brought to the test and turned to best account. I want to urge, not for a selected few, but for all employed in the railway service, a chance or several chances in the opening years of their employment as the best policy for the railways themselves.

"We may also ask ourselves whether the departmental organisation is not carried too far. Three kinds of capacity are wanted on railways: capacity to make and do, capacity to buy and sell, capacity to plan and think.

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Very occasionally are these capacities combined at a high level in one individual, but, given one of these capacities, it has aptitudes for many varieties of work. Take the makers and doers. They are the engineers and superintendents of operation. Should they not have a common training and a common prospect? Should they not specialise at a much later stage of their career than is the case? Their initiation into business life stamps them finally as civil or mechanical engineers, superintendents of trains or docks. The same argument applies to the buyers and sellers. How early they get into ruts as goods or passenger or mineral agents! This intensive culture of ability may provide a succession of efficient officers for a department, but it will never revolutionise the department. It is a plan to foster conservatism and tradition. It will never supply, except by accident, a first-class general officer. Unless specialised training and experience is only a graft upon a broad training and a varied experience it unfits a man for general management, of which the chief endeavour must be to secure coherent action by many departments."

Practical Schemes.

LORD ASHFIELD next discussed briefly what is being done in this direction by various railway companies—the Great Central Railway Higher Grade Examination Scheme, based upon the result of a competitive examination, the Higher Grade Apprenticeship Scheme of the London & North Western Railway, and the North Eastern and "Underground" cadet systems, by which members of the staff are recruited for practical training from among those who have had the good fortune to enjoy an advanced education. To these might be added the Traffic Apprenticeship system inaugurated by the North Eastern Railway, providing for a systematic course of training, with a reasonable salary attached, open to all who have sufficiently studied the more elementary aspects of railway working to pass a qualifying examination. The differences in the schemes adopted and in the methods tried represent the diverse thoughts of many people seeking to solve one problem, the provision of an adequate number of chief clerks, assistants, inspectors, supervisors and so forth, from which to select capable officers and managers. "Others may be able to speak to you more authoritatively about the results of these endeavours; I only want to suggest to you here that an exchange of experience might help a long way towards a generally approved scheme such as this Institute might recognise, and all might adopt."

"The second stage is more difficult. There should be some exchange of staff between undertakings. There is something educative in a mere change of circumstances. It provokes new adaptations out of which progress springs. The best that happen to-day are visits of inspection. In my own companies, for instance, we have definitely taken up the policy of sending our officers and expectant officers to investigate and report upon traffic conditions in other metropolitan cities. Some went to New York and other American cities last year. Some went to Paris this. There is no question but that visits of this sort afford refreshment of mind and outlook, and are beneficial to the temper in which the work of the undertakings is conducted. More than this is wanted, and a scheme for the exchange of staff might not be impossible of establishment. It is capable only of a limited extension, but to whatever limit it is found practicable it ought to be tried.

"And education is never done. It is not once or twice that we need the provocation of an altered post, a new position. It is all our life long, if we are seeking to come out to the top and be a leader in transport. Teaching by doing is the key to business education, and the crucial point is to continue the education long enough to turn out a great man, stirring the mind to conquer ever new fields of endeavour. Our duty is to see to it that there is that environment in business which will bring out the best that is in the servants of business. If we would fix in our thoughts the idea which is literally true, that business is our university, it would transform the way in which we who now have the responsibility look at business on the one hand, and would transform the outlook and treatment of the rising staff who would one day take our places, on the other hand."

Quadruple-Body Trains on the Great Northern Railway.

THE "twin" system of construction for passenger rolling-stock has been in vogue for several years past on the Great Northern Railway, alone among British railway companies to adopt the practice. A start was made several years back by the conversion of some six-wheeled carriages into bogie stock on what was then the new principle with twin carriages on three bogies, and subsequently further conversions of a similar kind took place, whilst new passenger rolling-stock built on the same principle was added, mainly for suburban traffic. There are also several sets consisting of three (four bogies), four (five bogies), and five (six bogies) coach combinations.

Mr. H. N. Gresley, Locomotive Engineer of the Great Northern Railway, is now

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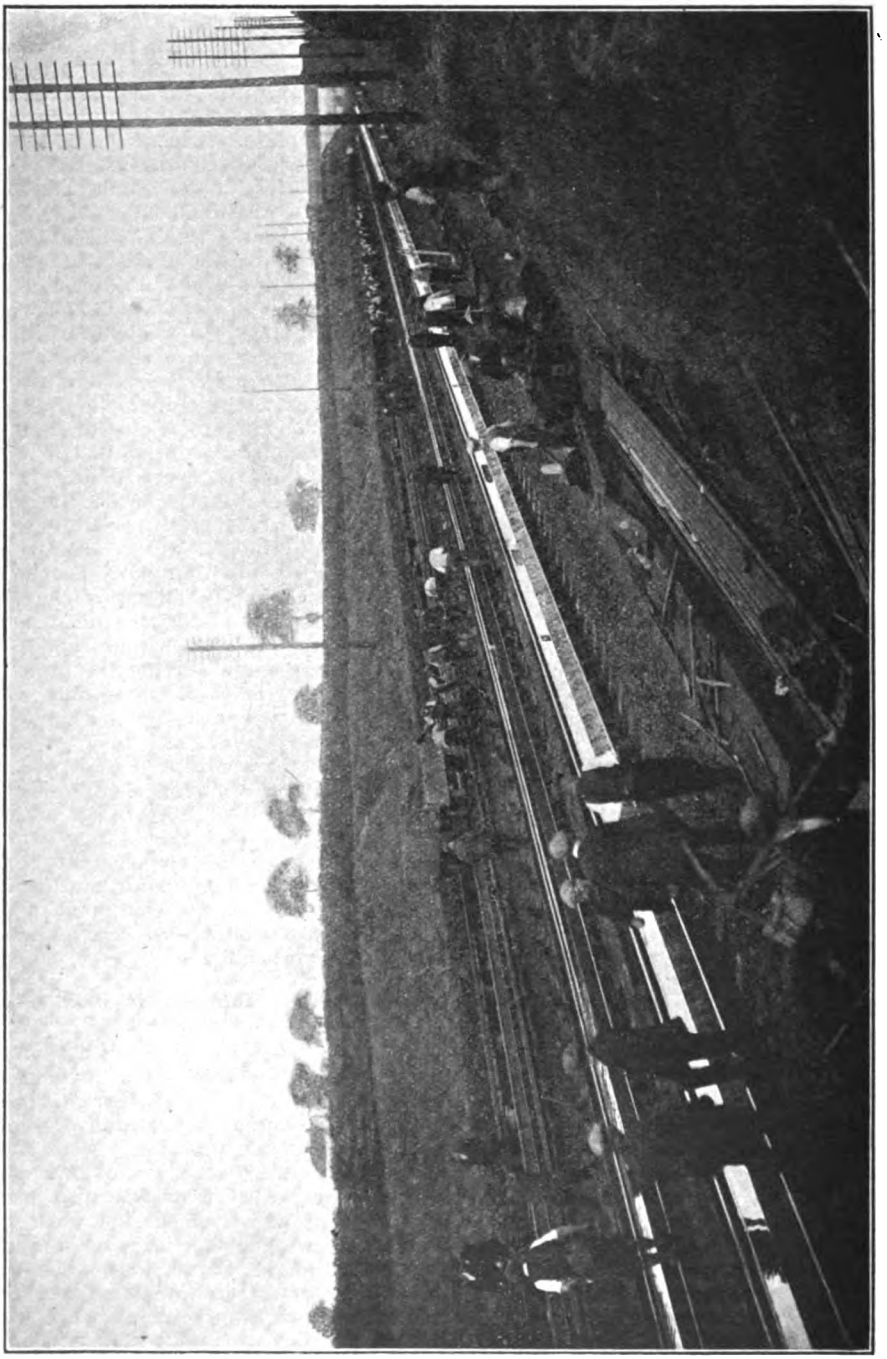

RELAYING AT OAKLEY, MIDLAND RAILWAY.
View of Section from South End.

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carrying the same principle further by converting the suburban trains built in 1912-13 on the twin-bogie principle, in which each pair of vehicles is fitted with three instead of four bogies, into trains consisting of two sections of four coaches, each running upon five bogies, or ten bogies for the complete train of eight vehicles. To permit of this being done new middle carriages are being constructed, so that the trains when completed consist of four new coaches and four of the older ones, with a saving of one bogie for each half, or four-coach section, of the train. This has the effect of eliminating the cost and weight of two bogies per train and slightly reducing the over-all length. The complete train as formerly constructed weighed 151 tons 1 cwt., and measured 338 ft. 2½ in. long. The average weight per passenger was 4·78 cwt. In the new trains the weight is reduced to 143 tons 3 cwt. 1 qr., giving an average weight per passenger of 4·53 cwt. The seating capacity of the train in either case is 632 passengers, the make-up being as follows:—Brake and third, all third (three coaches), first and third composite (two coaches), all second, second and brake. This is, we believe, the first instance in which carriages already constructed on the twin-bogie system have been converted so that an even fewer number of bogie trucks are required in the make-up and total length of a train.

Relaying at Oakley, Midland Railway.

RELAYING operations were commenced on Sunday, September 19, on the Midland Railway main line between Oakley and Sharnbrook on a section occupied by water troughs. Four consecutive Sundays were devoted to the work, the length of each line to be relaid being 27 chains. A start was made by removing half of the permanent way forming the up fast line, work commencing at 5 a.m. and continuing throughout the day, both the up and down passenger lines being closed to traffic, the up line from 5 a.m. to 10 p.m., and the down line from 5 a.m. to 6 p.m.

Traffic was diverted trom the passenger to the goods lines, at Bedford for down, and at Irchester for up trains, water pick-up facilities being available from the troughs laid between the goods lines at Oakley. Arrangements were planned for relaying the lines in half-sections, each comprising 13½ chains, and such excellent progress was made on Sunday, the 19th, that the track had been replaced by mid-day for the half-section taken out on the up passenger line, the work of replacing the water troughs and connections being proceeded with in the afternoon, the whole being completed and opened for traffic by 8 p.m.

These troughs, which are the most southerly ones on the Midland Railway, were laid down in 1903. They are 1,670 ft. in length and are laid in 167 lengths of 10 ft. each. Water is pumped from a well by the side of the River Ouse, which passes under the railway at a point some 200 yards from the southern end of the troughs, between the latter and Oakley Station. It is lifted into two large tanks, one on each side of the main line. Each of these tanks has a capacity of 42,000 gallons of water. One tank supplies the up and down passenger and the other the up and down goods lines. The troughs themselves hold 5,000 to 6,000 gallons of water, and it is estimated that locomotives each take up about 2,000 gallons in passing over them. There is, of course, considerable unavoidable wastage in addition. As one trough is depleted the water from the adjacent trough flows into it until the level is the same in both, then by means of automatic valves the tank at the side of the line fills them both up, the water being automatically cut off when the troughs are full.

The troughs themselves have not been renewed, as after their 17 years' service they still remain in perfectly good condition. The material used is galvanised steel. The troughs measure 18 in. wide by 6 in. deep and the depth of the water in each trough is 5 in., the level standing 1 in. below the top of the trough. About 30 trains take water from the troughs daily, many, of course, passing over without doing so, either for the reason that the engines are not fitted with scoops, or that the trains are of a local character, while several of the expresses stop at Bedford, where water supplies are available.

The Midland Railway has five sets of water troughs, viz., at Oakley, Loughborough, Melton Mowbray, Tamworth and Hawes Junction, all being of the same length, 1,670 ft.

Which is the Shortest Route from London to Manchester?

A correspondent is responsible for an interesting study in railway distances, showing the possibilities of composite train routing. In this case the study has no practical value, as the route includes too many transfers between main, and branch or connecting trains, but the communication is well worthy of careful consideration, and may be left to speak for itself as follows:—

"How many RAILWAY MAGAZINE readers could state correctly the shortest route between any terminus in London and any terminus in Manchester? In point of fact, the route in question lies over four of our leading main lines and one joint line, and

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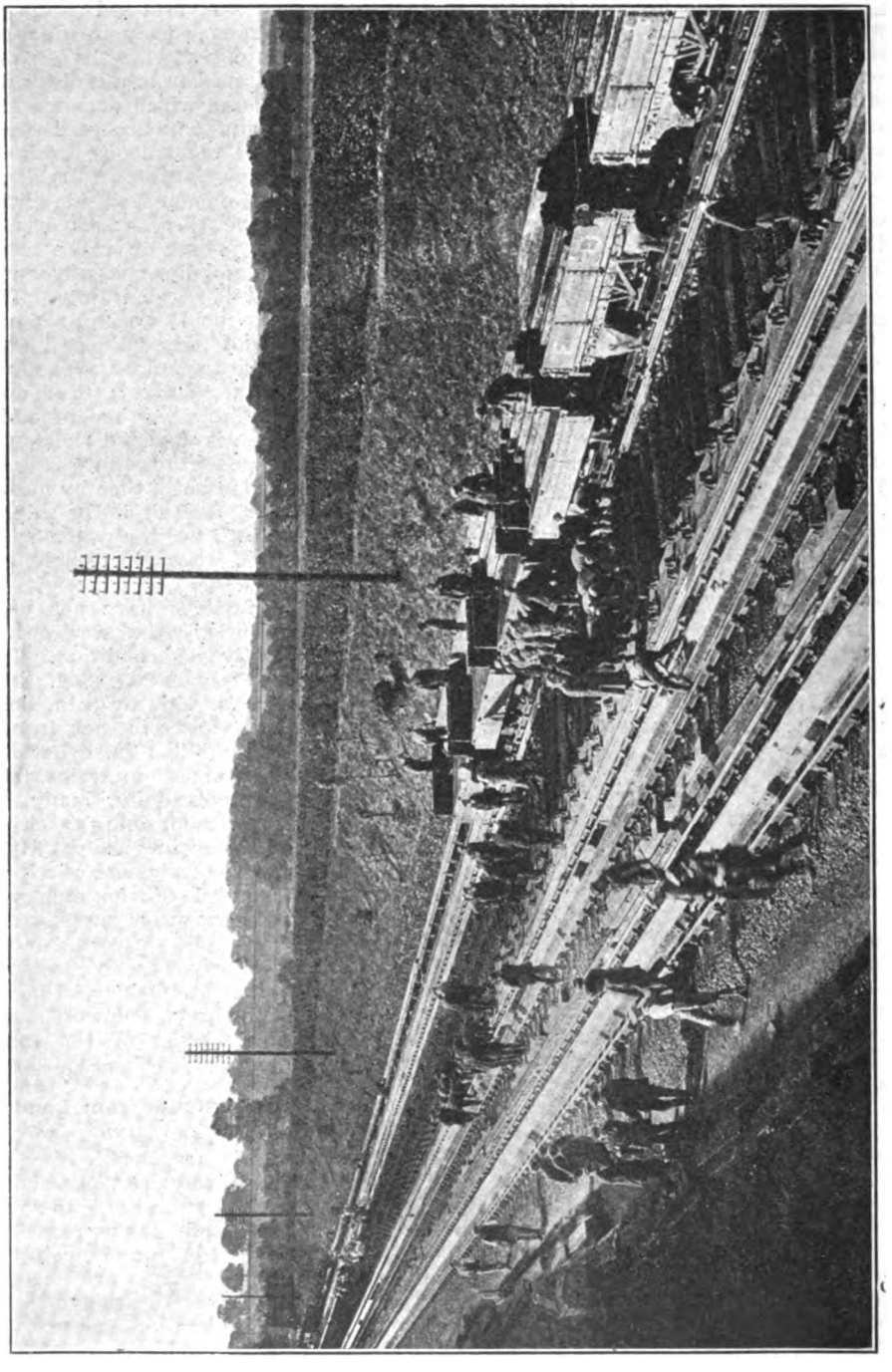

RELAYING AT OAKLEY, MIDLAND RAILWAY.
View from North End of Section. Up Main Line and Water Trough taken out.

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the railway whose metals are used for three-quarters of the distance neither owns nor runs into the termini at either end. It is necessary to start the journey from London at King's Cross, Great Northern Railway, and use the main line of that company as far as Hitchin, 32 miles. Here we diverge on to the Midland Railway in order to reach Bedford. Most readers will remember that this was the route taken by Midland trains to reach London prior to the opening of St. Pancras terminus in 1868; it is a shorter route to the Metropolis than the Midland main line by 1½ miles.

"Following the Midland line from Bedford all is plain sailing past Leicester and Trent to Derby, where, of course, we take the direct line from Spondon to Nottingham Road, avoiding Derby Station; we then continue to New Mills South Junction, north of Chinley, and 170¾ miles from London by this route. Here the Midland main line makes a wide sweep to the west to reach the Central Station in Manchester, and so we diverge on to the Great Central and Midland Joint Line from New Mills through Marple (which used to be followed as far as Romiley by all Midland Manchester expresses before the direct line was made through Cheadle Heath) to Ashburys, 12¼ miles distant, where the Great Central Manchester main line is joined. Following the latter for three-quarters of a mile, we run on to the London and North Western Manchester main line at Ardwick Junction, and another three-quarters of a mile along this route brings us into London Road terminus. The total distance covered has been 184½ miles, against 189½ miles from St. Pancras to Manchester Central, avoiding Derby, or 188½ miles from Euston to London Road, *via* Styal. Through Midland trains for Manchester (Victoria) travel from New Mills *via* Marple and Ashburys, and thence on to the Lancashire and Yorkshire Railway at Miles Platting, and it is interesting to note that Victoria is nearer St. Pancras by one mile than Central Station; consequently, King's Cross-Victoria is also shorter than either Euston-London Road or St. Pancras-Central."

Train Services on the Portsmouth Route, London, Brighton & South Coast Railway.

COMMENTING upon our remarks on page 206 of the September RAILWAY MAGAZINE, one of our earliest subscribers sends an analysis of train working on this route, which, as he says, "bear out very cogently the force of your remarks as to the numerous junctions and branch services which have to be taken into account." Travelling by the 8.55 a.m. ex Victoria, the following connections were noted:—At Horsham: from London *via* Dorking, Three Bridges, Brighton *via* Steyning and the Guildford line; to main line slow train for Portsmouth and Hayling Island, Guildford line, and Brighton *via* Steyning. At Arundel, from and to Littlehampton. At Barnham Junction, to and from Bognor. At Chichester, to Midhurst, and Mondays excepted to Selsey. At Fratton, to London and South Western Railway train for Fareham, &c. These exclude any connections which may be made at East Croydon.

"Surely a record for a distance of under 50 miles (Horsham-Fratton); probably no line but the London, Brighton and South Coast, or possibly the Lancashire and Yorkshire, could equal it, and it does not take an expert to realise how enormously such a multitude of connections increases the possibility of delay to the express, and also one might add, necessarily increases the time spent at stations *en route*. This is hardly one of the crack Portsmouth trains, yet its overall time of 2 hours 26 minutes, with six intermediate stops, is far from discreditable."

Our correspondent continues as follows:—"It may interest your readers to know that when Royalty travels to Portsmouth, the London, Brighton and South Coast Railway route (*via* Dorking) is followed, and a standard schedule of two hours from Victoria to the South Jetty, Portsmouth, is in force, the run being made without a stop, except a momentary one at Portsmouth Harbour signal-box to take up a pilotman. This is virtually the same schedule as that of the crack 11.35 a.m. Victoria-Portsmouth express, with its non-stop 111-minute booking to Fratton. In both cases, Leatherhead to Chichester, pass to pass, has to be covered in 60 minutes for the 49¼ miles, including the ascent from Box Hill to the Holmwood summit, and several service speed restrictions. There are probably no harder tasks set the Brighton engines than this—the 11 35 a.m., be it noted, is frequently worked by a 4-4-2 *tank* engine."

An Old Midland Locomotive.

WE are indebted to Mr. Chas. S. Lake for the photograph reproduced, showing an old outside-framed goods engine No. 2,821, rebuilt with a boiler and cab of relatively modern design. These engines have a somewhat interesting history, and the following remarks, kindly supplied by Mr. E. L. Ahrons, may be quoted:—

"The illustration shows one of about 20 of the old Midland double-framed goods engines, to which larger boilers were supplied in 1908-1909 by Mr. R. M. Deeley, then Chief Mechanical Engineer. The engines were originally designed by Mr. Matthew

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Kirtley, and were the standard type of goods engine from 1869 to 1874, with 17-in. by 24-in. cylinders, 5-ft. 2½-in. coupled wheels and 140-lb. pressure. All were rebuilt by Mr. Johnson between 1881 and 1890 with the standard boiler of that period.

"In 1906-8 the 4-4-0 express engines of 1898 to 1901, with piston valves, now forming the series 483 to 562, were rebuilt with larger boilers, and as many of the original boilers of these engines were in good condition, Mr. Deeley decided to utilise them for some of the old goods engines. These boilers carried 160-lb. pressure, and had a total heating surface varying from 1,205 to 1,233 sq. ft., of which the fireboxes (of large size) contributed 128 sq. ft. In fitting them to the goods engines, certain modifications were made to the latter. The cylinders of most of them are 18 in. by 24 in., the boilers are pitched with their centres considerably higher from the rails than in the ordinary type of rebuilt goods engines; new cabs and side sheets to the footplate, and also new large sandboxes outside the frames on both sides of the driving wheels were provided. The engines so rebuilt were about 20 in number, now numbered between 2,800 and 2,869, and were originally constructed by The Vulcan Foundry Company and Dübs & Co., in 1872-1874."

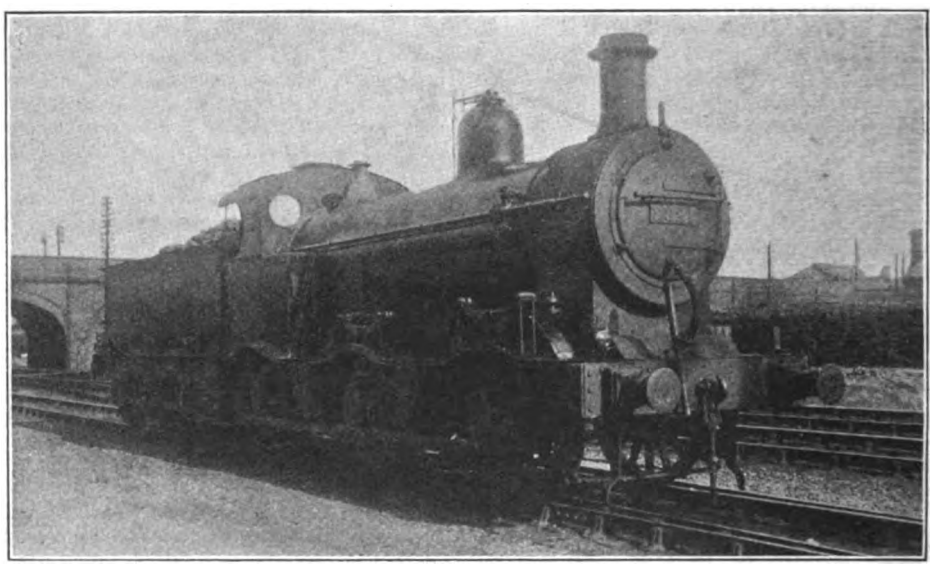

Photo.] MIDLAND RAILWAY. [*Chas. S. Lake.*

Old 0-6-0 locomotive, No. 2821, as rebuilt by Mr. R. M. Deeley.

Ministry of Transport Passenger Traffic Statistics.

HITHERTO the railway statistics issued by the Ministry of Transport have been concerned only with goods and mineral traffic; but particulars of passenger traffic are now included, commencing with the month of July. It is to be regretted that they do not cover the same periods as the freight traffic, whose statistics are issued for four-weekly periods; but that is due to the conditions under which booking-office returns are made out, and may be adjusted in due course. During the month of July last the railways of Great Britain conveyed 152,392,497 passengers, excluding season-ticket holders. Of this number 68·26 per cent. paid full fares, 27·18 were workmen, and the balance of 4·56 per cent. were carried at other reduced fares. The average receipt per passenger was 16·09*d.*

During the month there were 3,583,051 passenger journeys with first-class tickets, realising 62·71*d.* per journey, and a total of £93,693; second-class passengers numbered 615,120, and realised 37·61*d.* per journey, total £96,407; and the third-class 148,194,326 journeys, at an average of 14.87*d.* each, value £9,181,083. On their merits first-class passengers undoubtedly paid their way, but the third-class is, of course, the back-bone of the traffic. The second-class is largely used for season-ticket

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traffic, where it is still provided for, and does not apply to many railways, so that its statistics are necessarily small, apart from season-ticket travel.

In regard to totals, the London and North Western Railway heads the list with 11,622,499 passenger journeys, followed by the Great Western with 10,984,282, and the Midland with 10,835,526. In Scotland the North British leads with 5,314,725, closely followed by the Caledonian with 5,153,667. These figures are, however, based upon the records of the originating system, and, therefore, do not take into account composite routing. By grouping all the "Underground" lines, a higher total than any of those given is realised for the Metropolitan District, London Electric, City and South London, and Central London Railways, whose aggregate figure was 27,398,394 for the month.

During the four weeks ending July 18, 36 steam locomotives were completed and placed in traffic against 12 condemned; 2,459 merchandise and mineral vehicles added to stock as compared with 1,354 condemned, sold, etc.

Locomotive Working on the Great Northern Railway.

MR. C. H. DUNK, of Leeds, writes pointing out that all the "Ivatt" 4-4-0 engines of the 400 class have now been rebuilt and fitted with larger boilers. He also sends some remarks concerning the locomotives and working in the Leeds district, which possess features of interest. The sheds concerned are Ardsley, Leeds (Copley Hill) and Bradford. Most of the engines at Ardsley are engaged on goods and mineral traffic and include rebuilt Stirling 0-6-0's, all of which bear the load letter "B" on the vacuum pipes. There is also a large number of Stirling and Ivatt 0-6-0 saddle tanks at this shed. These engines have the letter "H" on the vacuum pipes. All of the 0-6-0 tank engines with the long sloping side tanks are shedded at Ardsley. The engines at Bradford and Leeds are mostly engaged on passenger work. Four of the 4-4-0 superheater class are at Leeds, viz., Nos. 51 to 54, also 2-6-0's No. 1634, small-boilered type, and 1652, 1658, and 1659, of the large-boilered series. These engines take turns with the Doncaster "Atlantics" on the London expresses between Doncaster and Leeds.

"The local passenger traffic, which in this district is very heavy, is worked by 4-4-2 tanks, 1020 class, also 0-4-4 tanks of Stirling and Ivatt designs. Four 0-6-2 tanks are now shedded at Ardsley, Nos. 1592 to 1595. These engines have not the condensing apparatus, as the other engines of the same class. Some of the 0-8-0 mineral engines of the 401 class, are now making their appearance. Recently I saw No. 107, Stirling 0-4-2 tender engine, rebuilt with domed boiler, working the Bradford portion of the 1.30 p.m. ex King's Cross. This engine, together with No. 108 of the same class, is shedded at Ardsley. At Ardsley I noticed 0-8-0's of three companies, shunting in the same siding; the engines were Great Northern Railway 0-8-0, 401 class; North Eastern Railway 0-8-0, class T2; and Great Central Railway outside cylinder 0-8-0."

The Coming of Age of the Railway Club.

This year the Railway Club celebrates its twenty-first birthday. In the RAILWAY MAGAZINE for May, 1919, there appeared a short history of this interesting institution, in which reference was made to the continued progress and activities of the club. Since that article was printed, another step forward must be chronicled; the acquisition of new and more commodious premises at 65, Belgrave Road, S.W. 1. The move was rendered necessary by the great increase in the membership, and the desirability of having a hall for meetings in the same building as the Club.

True to its name and tradition, the Railway Club continues its policy of discussing every branch of railway work; it was founded in 1899, to provide facilities for bringing together all who are interested professionally, or otherwise, in railways, both in their economic and technical aspects. A valuable and up-to-date library of books on railway subjects is available for the use of members, and the leading railway journals are taken. The papers read and in prospect deal with locomotives, signalling, carriages and wagons, politics and labour problems, railway history, engineering, goods working, light railways, law, electric lines, and future developments.

Many of those who have lectured before the Railway Club will be well known to readers of the RAILWAY MAGAZINE; among these may be mentioned Cecil J. Allen, W. J. Scott, G. W. J. Potter, J. F. Gairns, H. L. Hopwood, W. E. Edwards, Charles Travis, Edwin J. Miller and B. M. Bazley ("Basil Mercer"), the present honorary secretary. In addition, a number of eminent railway officers and other distinguished visitors have lectured to the Club.

The Committee realise that something more is demanded than a mere debating society, however good in quality; no pains are spared to promote the social side, and to render the Railway Club a true club and not an institute. Views can be exchanged and information acquired quite

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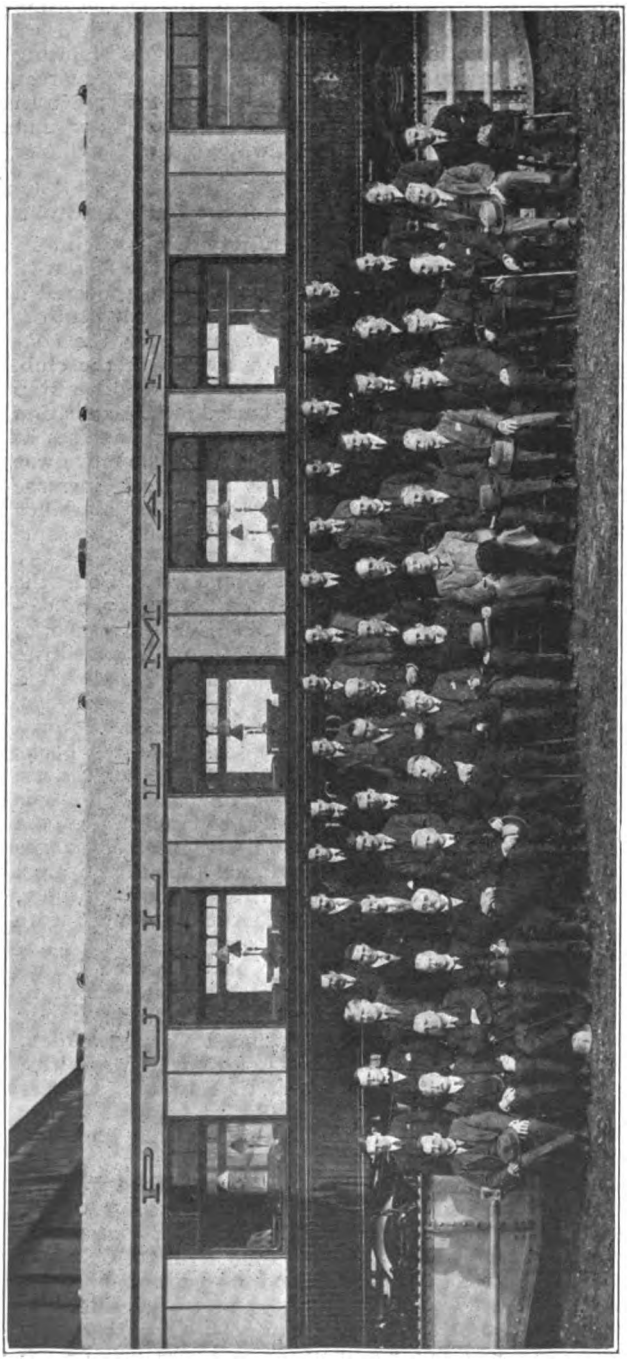
as much by individual conversation as by listening to lectures. On December 17 the fourteenth annual dinner will take place at the Holborn Restaurant; this deservedly popular function, which resembles in many ways the gathering of Old Boys round their *Alma Mater*, will set the seal of success on the twenty-one years' record of activity, and should prove a good augury for a long period of continued success and far-reaching influence in the future.



PULLMAN CAR "ARCADIA," NOW RUNNING ON THE GREAT EASTERN RAILWAY.
Photographed at the works of Clayton Wagons, Ltd., Lincoln.

Pullman Cars on the Great Eastern Railway.

On Monday, November 8, the first two Pullman cars built for service on the Great Eastern Railway were placed on public exhibition at Liverpool Street Station, and some hundreds of people took the opportunity of inspecting these palatial vehicles. One of them is illustrated herewith, photographed at the works of Clayton Wagons, Limited, at Lincoln, where 10 of the 20 cars are being constructed.

The two cars so far delivered—the "Arcadia" and the "Corsair"—commenced duty on Armistice Day on the following trains: The former leaves Cambridge for Liverpool Street at 7.49 a.m., returning on the 6.30 p.m. down train. The other car makes a number of trips, as follows:—Week-days (except Saturdays), 8.44 a.m. Southend to Liverpool Street; 10.20 a.m. Liverpool Street to Clacton; 1.36 p.m. Clacton to Liverpool Street; 4.48 p.m. Liverpool Street to Southend; 7.20 p.m. Southend to Liverpool Street; 9.45 p.m. Liverpool Street to Southend. On Saturdays the following trains are worked:—8.44 a.m. Southend to Liverpool Street; 10.20 a.m. Liverpool Street to Clacton; 1.36 p.m. Clacton to Liverpool Street; 8.2 p.m. Liverpool Street to Southend. The supplements charged for travelling in these cars are 1s. 6d., 2s. or 2s. 6d., according to distance.

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Although the cars so far delivered are intended for first-class traffic, there will also be some third-class cars, and, when the order is completed, a notable series of Pullman cars will be provided for travellers on the Great Eastern Railway, in conjunction with the restaurant car services with which many trains are already provided The new cars are constructed in accordance with the well-known Pullman principles, and are luxuriously upholstered and furnished. The first-class cars accommodate 21 passengers, nine in the main saloon, eight in a second saloon, and four in a smaller semi-private compartment. Provision is made for the supply of refreshments. We hope to describe these cars fully in a subsequent issue, and meanwhile we have to congratulate the Great Eastern Railway Company and the Pullman Car Company upon their enterprise in thus developing the conveniences and comfort of travel in East Anglia.

Metropolitan Railway School for Railwaymen.

EFFICIENCY begins with men, and recognising this the Metropolitan Railway has arranged for Dr. Henry Chellew, D.Sc., Ph.D., F.C.I., late lecturer to the University of London, to give a series of lectures to the whole of their clerical staff, covering every phase of modern methods. These lectures, the first of which was held on Tuesday, November 2, are to be continued on alternate Tuesdays throughout the winter months up to and including March 22, 1921, and should prove an important factor in the elimination of waste and the securing of a higher percentage of result, and, at the same time, go far to develop energy, initiative and resourcefulness in their staff, reflecting to the advantage of the travelling public.

The introductory lecture was attended by some hundreds of the staff of all grades, and was presided over by Mr. R. H. Selbie, C.B.E., the Metropolitan Railway's General Manager. The following are the chief points raised by Dr. Chellew :—The railway system is one of the greatest wealth creating machines employing capital in the service of man, and is the greatest factor which makes steadily for the development and progress of the nation; travel is one of the chief factors in educating the community. Passenger travel should be encouraged in every direction. Transport is the most important of all our civic institutions. The railway aims at the development of the resources of the district it covers as well as stimulating urban enterprises; it also increases civic revenue in order that there may be expansion and extension of essential enterprises. There are many possibilities of greater economy in all directions of railway administration where the science of operating is concerned. The main factor aimed at should be: Efficient service as to (*a*) time, (*b*) train loads, and (*c*) efficient organisation of station service. The constant need for the increase of staff efficiency and co-operation and loyalty between the units of the entire railway service. These ideals are founded upon progressive ideas which arise out of the necessities of our modern complex civilisation, wherein the railway system is the chief artery of communication.

The following is a list of the subjects proposed to be dealt with in subsequent lectures, and give an idea of the comprehensive nature of the course :—" The Human Mind : What it is and how it works "; " The Science of Personal Efficiency " " The Laws of Health "; " The Secret of Concentrating the Mind "; " The Will and how to Develop it "; " How to make a Map of Yourself "; " The Science of Industry "; " How to Save Time, Energy and Money "; and " The Royal Road to Success."

Piston Ring Design.

IT is not often recognised that ordinary Ramsbottom piston rings are capable of producing heavy friction losses in reciprocating engines, and very little thought is given to the leakage which undoubtedly takes place to a very considerable extent with normal designs of piston rings and to the various sources of leakage which can take place, both in regard to the motive fluid and of lubricant. Great importance, therefore, attaches to the claims which are made by Allen & Simmonds (Reading), Limited, for their special designs of piston ring, which have features designed to overcome the disadvantages enumerated.

The adoption of a very narrow bearing surface for the piston rings results in an obvious economy in the decrease in frictional losses. In the types of " Allen " ring in use to-day the width does not in general exceed $\frac{1}{8}$ in., moreover, the possibility of the working pressure getting behind the ring and expanding it against the cylinder walls has been ingenuously neutralised by the provision of a frictional drag on one face of the groove. In the " Oblique " type of piston ring illustrated, as applied to an ordinary piston with junk ring, the wedge-shaped ring is controlled by a spring (A) set obliquely at such an angle that the main component of its force is employed to push the ring against the side of its groove, and only a relatively small resultant force is used for the outward expanding tendency on the ring. This fact, coupled to the narrow bearing surface of the ring, results in a notable saving of friction losses. Other variations of this design are

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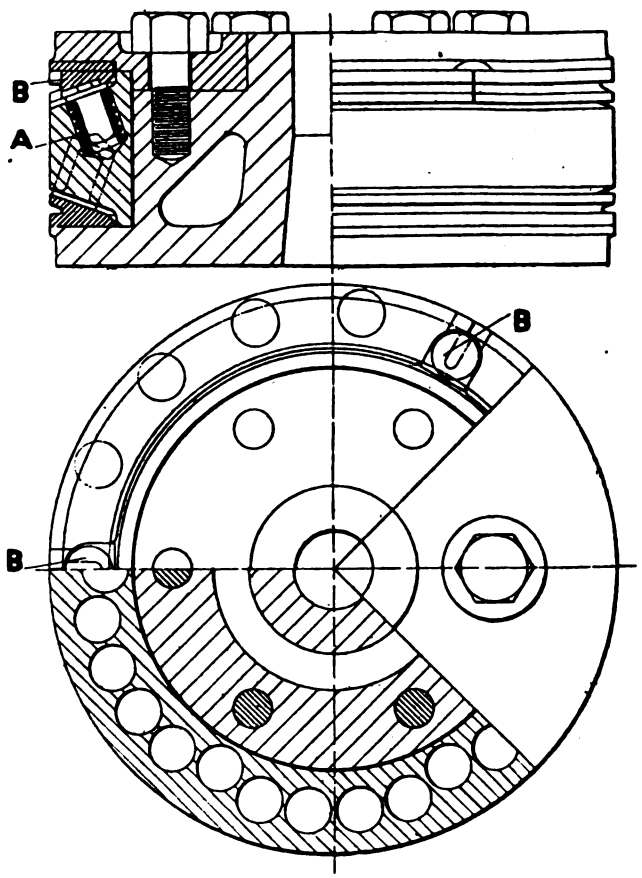
available in which the springs are not set obliquely, but a wedge is introduced which gives the same effect, while taking up less room. This type of ring has also been used at the lower end of the piston skirt as a "slap preventer" with excellent results in internal-combustion engines.

Economy is also achieved by the greatly improved pressure tightness which is obtainable with these piston rings. Each ring is split at three or more places, depending with springs behind them at each slit, to give the necessary outward thrust. Rings of these types have been adopted for many classes of engines, steam and internal combustion, and it is stated that as applied in one of the London railway generating stations, a coal economy of 40 tons per week was obtained from one large unit.

The works at Reading where the Allen piston and its rings are produced, is a self-contained factory of considerable capacity.



ALLEN PISTON AND RINGS FOR HIGH-SPEED STEAM ENGINE.

upon the shape or error of the cylinder in which it is intended to work. The loss of pressure across the slits is ingeniously overcome by the provision of choke-pieces (B), which are so arranged that the outer bearing surface of the ring is perfectly continuous. In the oblique type ring illustrated the expanding force, as previously mentioned, is obtained by the disposition of the springs or wedge equivalent; in earlier types wedge-shaped choke-pieces were utilised

We were recently privileged to inspect the whole organisation, which includes also the manufacture of other types of piston rings as well as many motor car accessories up to and including body and engine parts building. The works are well-equipped for making castings in iron and non-ferrous metals; they have extensive plant for heat treatment of materials and a fine machine tool equipment.

Sufficient has been written to show that the

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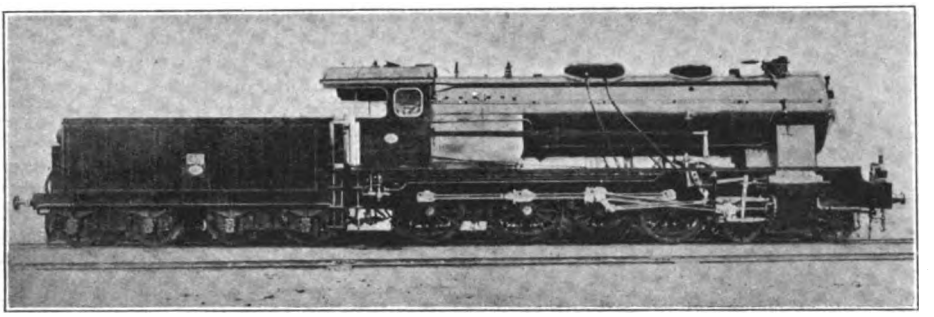
piston rings provided by Allen & Simmonds are first-rate articles with considerable potentialities for economy in steam and other plants. The saving of 10 per cent. in steam consumption is a matter well worthy of careful attention in these days of high fuel costs, and this is a figure which we are assured is quite a normal result following upon the substitution of Allen piston and rings for the cruder types which are so widely used. In addition, the principle has been applied successfully to pump pistons, with excellent results from both the points of view of economy and durability, and the designs which have been formed and developed undoubtedly represent an important advance in power plant engineering.

SPANISH-BUILT 4-8-0 PASSENGER LOCOMOTIVE.



SPAIN has not hitherto figured to any great extent as a locomotive-building country, though some new construction is carried on. We are indebted to Mr. R. W. Unwin, of Barcelona, for the photograph reproduced. The engine is intended for express passenger service on severely graded lines, and despite the small diameter of the coupled wheels, has attained a speed of 65 m.p.h. Fifty of these engines, built by La Maquinista Terrastre y Maritima Barcelona, are on order for the Madrid, Zaragossa and Alicante Railway.

Cylinders	24 in. by 26 in.
Coupled wheels	5 ft. 3 in. diam.
Bogie wheels	3 ft. 2½ in. diam.
Grate area	49·5 sq. ft.
Heating surface—	
Tubes	2,177 sq. ft.
Superheater	629 sq. ft.
Firebox	176 sq. ft.
Total	2,982 sq. ft.

Overall length, engine and tender	68 ft. 4·8 in.
Weight of engine in working order	86½ tons.
Weight of engine and tender in working order... ...	142½ tons.
Tender capacity—	
Coal	6 tons.
Water	5,503 gallons.

JANUARY, 1921, RAILWAY MAGAZINE

will commence a New Volume

and also be a

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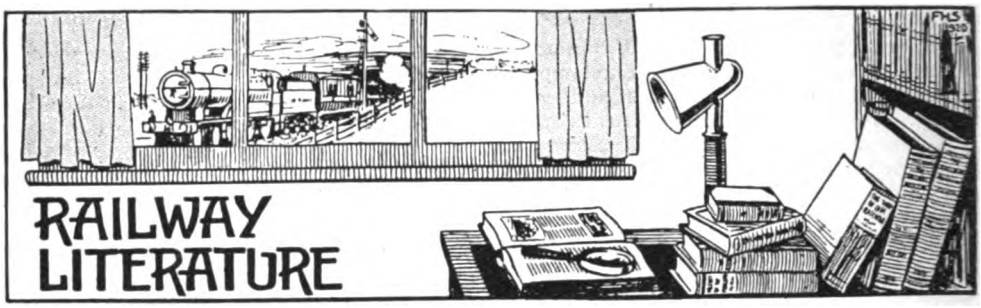

DEEDS OF A GREAT RAILWAY. By G. R. S. Darroch, Assistant to the Chief Mechanical Engineer, London and North Western Railway [John Murray, price 15s. net]. Described as a record of the "Enterprise and Achievements of the London and North Western Railway Company's Locomotive Department during the Great War," Mr. Darroch sets forth the special war work carried out at Crewe, from the armoured train equipped for home service in the event of invasion, to the converted Ford tractors and the manufacture of fuses, shells and other munitions of war which were supplied in so great numbers. In fact, Crewe became for the time virtually a branch of the Royal Arsenal at Woolwich, and the writer brings out the important influence exerted by Mr. Bowen Cooke personally in inducing the strong "munition" policy for which the resources of Crewe were so markedly utilised. Concurrently with his references to the London and North Western Railway war activities the author describes associated war and political history, thus enabling the course of events to be seen in correct perspective. The frontispiece is a fine portrait of the late Mr. C. J. Bowen Cooke, C.B.E., with an introduction by Mr. L. J. Maxse, and an attractive series of photographic reproductions add to the interest of the volume. The cover is black with red border line: the locomotive "livery" of the North Western.

WHEN LABOUR RULES. By the Right Hon. J. H. Thomas, M.P. [W. Collins, Sons & Co., Limited. Price 10s. net.]

Seeing that railways are only touched upon incidentally, there is not much that need be said in these pages. Naturally, Mr. Thomas takes the view that Labour is the coming governing power, and there is certainly no occasion why government should fail and the nation suffer merely from that cause. But whether the Utopian conditions suggested will ever be realised, is a moot question. Mr. Thomas makes out a good case in some respects, but it is theoretical socialism, and he does not show how the change-over is to be made. Nationalisation of railways, mines, electric power supply, shipping, &c., may be good in themselves; but, after all, the main problem is that of finance, and it would puzzle Mr. Thomas or anyone else to solve it equitably, reasonably and peacefully. Conditions may be better for the ordinary worker, manual or clerical, under a Labour Government; but changes may be two-edged—capital is not always taking an unfair advantage, and labour has some axes to grind on its own account. However, we welcome this interesting study of the thorny problems of the day.

REPAIRING OF LOCOMOTIVES. By E. L. Ahrons. [Locomotive Publishing Co., Ltd. Price, 3s. 6d. net.]

Locomotive construction and design have produced a number of technical works, but in this publication Mr. Ahrons deals with the very practical aspects which those responsible for the repair and maintenance of locomotives have to face. The present volume is the first of a series. It is in three parts, each usefully illustrated: (1) General considerations; (2) Stripping; and (3) Boiler Examination and Defects. Companion volumes are expected to appear as follows: Section 2—Boiler and Firebox Repairs (January); Section 3—Boiler Fittings and Accessories, Superheating, &c. (March); Section 4—Frames, Wheels and Axles, Springs, Axleboxes, &c. (April); Section 5—Cylinders and Motion (May). A great deal of practical information is concisely given in convenient form, and we anticipate a wide welcome for these useful volumes.

THE MODEL RAILWAY HANDBOOK. By W. J. Bassett-Lowke. [Bassett-Lowke, Ltd., Northampton. Price 2s. 6d. net.]

As the sixth edition of a work well-known and highly appreciated in circles interested in model railway design, construction and equipment, this volume brings up to date the large amount of useful information given in its predecessors. It is in no sense a catalogue: the information is presented to guide and assist the many builders and users of model railway plant, and covers the whole ground of this interesting subject. It is well written and fully illustrated.

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A COMPLIMENTARY dinner has been held in honour of Mr. J. Chas. Isaac, C.B.E., late Chairman of the Railway Accountants' Committee, by his colleagues on the Committee, to mark the occasion of his retirement from that position following his retirement from the post of Chief Accountant of the London and North Western Railway. To give tangible expression to the respect and esteem in which Mr. Isaac was held, Mr. de Pury, the doyen of the Accountants' Committee, presented Mr. Isaac, on behalf of the members, with a bookcase. In asking Mr. Isaac's acceptance of this gift Mr. de Pury expressed the sentiments of all the members of the Committee in wishing him a long life and continued good health in which to enjoy his well-earned retirement. Speeches in the same strain were made by Mr. R. Rigby (the present Chairman of the Committee) and several other members, to which Mr. Isaac suitably replied. Mr. Isaac's tenure of office as Chairman of the Committee of Railway Accountants covered a period of over three years, during which time many important financial questions affecting the Government and the railway companies were negotiated. Notwithstanding the very great strain, both mental and physical, attaching to the office of Chairman, Mr. Isaac carried out his duties with the utmost credit to himself and to the universal satisfaction of all those with whom he came in contact, whether on the railway or Government side.

MR. J. CHAS. ISAAC, C.B.E.,

Late Chairman of the
Railway Accountants' Committee.

WE record with regret the death which took place recently at the age of 70, of Mr. William Melville, C.B.E., M.Inst.C.E., formerly Engineer-in-Chief to the Glasgow and South Western Railway. Mr. Melville commenced his railway career on the North British Railway, and was with that company for nearly 14 years, going then to be Chief Assistant to the then Chief Engineer of the Caledonian Railway, with whom he remained for nearly nine years. He was appointed Engineer-in-Chief to the Glasgow and South Western Railway in 1891, retiring from that position on October 31, 1916. His most important work whilst with the Glasgow and South Western was the widening of the line from Port Eglinton Junction into St. Enoch in 1900–1, including the widening of the bridge over the River Clyde and the enlargement of St. Enoch Station, so that it had 12 platform lines instead of six. Mr. Melville was a Past-President of the Permanent Way Institution. He was Chairman of the Glasgow Munitions Board of Management, and received the honour of C.B.E., early in the present year.

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AT a recent meeting of the Railway Clearing House Goods Managers' Conference, a presentation was made to Mr. R. L. Wedgwood, C.B., C.M.G. (Chief Goods Manager of the North Eastern Railway), in recognition of the services he had rendered

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as Chairman of the Conference during the year. Mr. H. A. Sire, C.B.E. (Goods Manager, London, Brighton and South Coast Railway and the *doyen* of the Conference), supported by Mr. H. Marriott, C.B.E. (Chief Goods Manager, Lancashire and Yorkshire Railway), made the presentation, and referred to the unique gifts possessed by Mr. Wedgwood and to the ability with which he had discharged the many onerous duties which had devolved upon him during his occupancy of the chair, especially as regards the work he had undertaken in connection with the proceedings before the Rates Advisory Committee. The members of the Conference were particularly desirous that their gift should take the form of something for which Mr. Wedgwood had an expressed preference, and the Conference had ascertained that their chairman had a liking for antique furniture. They therefore asked his acceptance of an old Chippendale table, together with a handsomely-bound vellum address containing the signatures of the members of the Conference. Mr. Wedgwood, in thanking the Conference, said he was particularly pleased that the address contained the signatures of his colleagues and it would always be valued by him. Although the past year had been an exceptionally busy one, his duties as chairman of the Conference had been lightened by the ready co-operation and assistance given by the members, and it would always be regarded by him as a "red-letter" year in his railway career.

* * *

MR. G. H. EYRE, for 18 years Traffic Superintendent of Somerset and Dorset Joint Railway, has been presented with a silver tea and coffee service of Queen Anne pattern, together with a heavy silver-plated tray and an illuminated address, to mark the severance of his association with that line.

* * *

MR. ARTHUR NEAL, Parliamentary Secretary to the Ministry of Transport, has appointed Mr. John Murray, M.P., to be his Parliamentary Private Secretary.

* * *

MR. W. H. EDGE has been presented by his many Great Central Railway friends on the occasion of his retirement from the railway service, with a half-hunter gold watch, a case of pipes, and a silver pencil case. The presentation was made by Mr. W. G. P. Maclure, the Locomotive Running Superintendent, who referred to the lengthy service which Mr. Edge had rendered to the Great Central Railway, and to the feeling of regard which so many felt for him, as shown by the number who had subscribed to the testimonial. Mr. Edge, in a felicitous speech, suitably thanked the donors for the presents, which he said he would cherish for all time.

* * *

AT a meeting of Irish Managers' Conference, Mr. H. Hunt, General Manager, Londonderry and Lough Swilly and Letterkenny Railways, was unanimously elected chairman for the year 1921.

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MR. H. G. WILES, who for the past six years has been the manager of the Bath Spa Hotel, has been appointed catering superintendent to the Government of India Railways.

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THE twelfth annual meeting of the Great Eastern Railway Musical Society has been held, with the Rt. Hon. Lord Claud Hamilton, P.C., President of the Society, in the chair. In proposing the adoption of the report and balance sheet for season 1919–20, his lordship commented upon the enthusiasm shown on the part of all connected with the Society, without which, and the excellent support and ability of the Honorary Conductor, Colonel Galloway, and the Honorary General Secretary, Mr. A. W. Headley, the success which they had attained could not have been effected. The officers and members of committee having been re-elected, Captain F. H. H. Thomas, O.B.E., T.D., was appointed to the committee to represent the Secretary's Department in place of Mr. C. H. Jeune, retired in accordance with rule. Votes of thanks were given to the chairman, directors and officers of the company for their valuable support, and to the honorary conductor, officers and the chairman and members of the society for their services. The first concert of the season was given on November 3.

* * *

IT has been decided by the North Eastern Railway directors to establish a system by which men may be selected from the clerical staff upon the results of competitive examination for special training with a view to fitting them for responsible posts in the traffic departments of the company's service. Men selected in this way will be called traffic apprentices. Candidates for such appointments must be between the ages of 18 and 22 inclusive on the last day of the month in which the examination takes place, but at the first two examinations candidates will be specially accepted up to and including age 30. The first examination for this purpose will be held in January, 1921,

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and the second examination in October, 1921. Thereafter examinations will be annually in April, commencing April, 1922. These examinations will be conducted throughout by the authorities of the Leeds University and the Armstrong College, Newcastle, who will set and mark all papers, and will report the results to the company.

* * *

MR. C. J. Selway, C.B.E., Superintendent of the Line, Great Northern Railway, has been unanimously elected Chairman of the Railway Clearing House Superintendents' Conference for the year 1921.

* * *

BY the recently-celebrated centenary of Messrs. W. H. Smith & Son, attention is drawn to the fact that the firm were in business as booksellers for about 28 years before their first railway contract was made with the London & North Western Railway in 1848, when they opened their first railway bookstall at Euston Station.

* * *

REPRODUCED on this page is a photograph which has been sent us by a correspondent; it neither represents an attempt at camouflage, nor is it a railway scene as viewed after immoderate indulgence in Government ale. The Midland Railway train represented was perfectly normal, and so was the photographer. But owing to the accidental application of heat while the negative was being dried, a portion of the emulsion melted, with the result that the picture became distorted. The behaviour of the landscape in the background to the right, and the very unusual degree of rail corrugation, combined with creep, are particularly noteworthy. The signal on the left, it will be observed, remained immune from this particular type of Bolshevism.

* * *

TAKING as his subject "A Suburban Electric Train Service," Mr. J. S. Ford-Stevens placed before the Railway Club, at the November general meeting, a paper as practical as it was pleasing. To illustrate his points Mr. Ford-Stevens dealt with the London suburban services of the Great Northern Railway, and demonstrated how, by a comparatively small financial outlay, stations and services could be so improved that almost all the advantages of electric service could be obtained by steam locomotive working and thus avoid the vast expenditure entailed in installing and maintaining an electric system. An animated debate followed Mr. Ford-Stevens' address, and he was both cordially thanked and complimented.

* * *

"AN Hotel of Distinction"—Such is the title of a charming brochure, copies of which may be obtained gratis by RAILWAY MAGAZINE readers from the Assistant General Manager (Publicity Department), Great Eastern Railway, Liverpool Street Station, London, E.C.2. It refers to the recently

A RAILWAY PHOTOGRAPHIC DISTORTION.

(See paragraph on this page.)

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acquired Felix Hotel, Felixstowe, illustrated on page 324, November RAILWAY MAGAZINE. The booklet is bi-lingual, being printed in English and French, and it is beautifully illustrated.

* * *

THE Central Commercial Department of Sir W. G. Armstrong, Whitworth and Co., Ltd., has removed from 3, Woodstock Street, Oxford Street, W.1, to 10, Great George Street, Westminster, S.W.1, the London head office of the firm.

* * *

SIR ERIC GEDDES, Minister of Transport, in a recent speech to the British Association of Chambers of Commerce, outlined his proposals for dealing with British railways. It was only fair, he said, that the State should share in any additional prosperity it had been the means of creating, and when the surplus profits got above a certain level the rates must come down. He did not want to ask Parliament to vote direct sums to help the backward districts, but his object was to create a fund which would be used to help weak districts under proper Parliamentary supervision. These proposals were the only alternatives he and his colleagues could see to nationalisation.

LONDON, BRIGHTON & SOUTH COAST RAILWAY.
The Roll of Honour at London Bridge, Armistice Day, 1920.

STRONG measures to cope with the refusal of the Irish railwaymen to convey troops and munitions were included in an Order in Council issued on November 12. By the terms of the Order "the competent naval and military authority" is empowered not only to restrict and prohibit traffic, but to take possession of any railway undertaking.

* * *

A MEETING of the staff of the London, Brighton and South Coast Railway was held on Armistice Day (November 11) at the London Bridge offices to commemorate the second anniversary. The company's Roll of Honour, surmounted by a wreath of laurels and draped by Union Jacks, was set between two palms and displayed in the meeting room. Beneath the Roll of Honour were the framed words: "Their name liveth for evermore," while at the foot was shown a list of those members of the staff who had been awarded decorations during the war. A few minutes before 11 a.m. the meeting was addressed by the Chairman of the Company, the Right Hon. the Earl of Bessborough, K.P. After the two minutes silence had been reverently observed the first verse of the hymn, "Oh! God, our Help in Ages Past," was sung, followed by the first verse of the National Anthem.

* * *

IT is a tribute to the keen interest of the British public in all things pertaining to railways that a firm with the extensive manufacturing resources of Messrs. Bassett-Lowke, Limited, of Northampton, can profitably, and yet almost exclusively, concentrate on the production of miniature railway rolling-stock and equipment. The success of this well-known firm is doubtless due in large measure to the fidelity of their models to the prototypes, and to the fact that, as a result of the years of experience behind their productions, Bassett-Lowke models can be relied on to "work." Beyond this, however, the reflection cannot be avoided that in the miniature railway there is that which is instructive as well as amusing; indeed, it very often turns out in the end that the parent becomes the most enthusiastic operator of the model line, rather than the boy for whose amusement the line was purchased! The new Bassett-Lowke section "A" catalogue—a tasteful and well-illustrated production, which can be obtained by RAILWAY MAGAZINE readers for 1s. 6d. post free—gives a comprehensive idea of the model railway activities of the firm; all the leading British railways are represented among the models made and stocked, and in sizes ranging from the diminutive machines for the 1¼ in. gauge to the well-known 15-in. gauge scale models, which

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have a haulage capacity up to 100 people, and a potential speed of 35 m.p.h. In gauges up to 2½ in. there is a choice in propelling power between clockwork, electricity and steam, each of which has its advantages, without in any way affecting the appearance of the models externally. Those desiring a closer acquaintance with Bassett-Lowke work would do well to visit the London showrooms at 112, High Holborn, close to Kingsway, where an extensive range of miniature railway equipment is on view.

* * *

ON Armistice Day (November 11), the Great Central Railway train which left Manchester at 8.30, and arrived at Marylebone at 1.15, was drawn by the engine "Valour" which carried two wreaths—one on each side of the name-plate—provided at the expense of the employees at Gorton. The wreaths bore the following inscription: "In memory of the Great Central Railway employees who gave their lives for the country, 1914–1918."

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TAFF Vale Railway 0-6-2 tank engines of the type illustrated and described in the November RAILWAY MAGAZINE, have now a working pressure of 175 lb. per square in.

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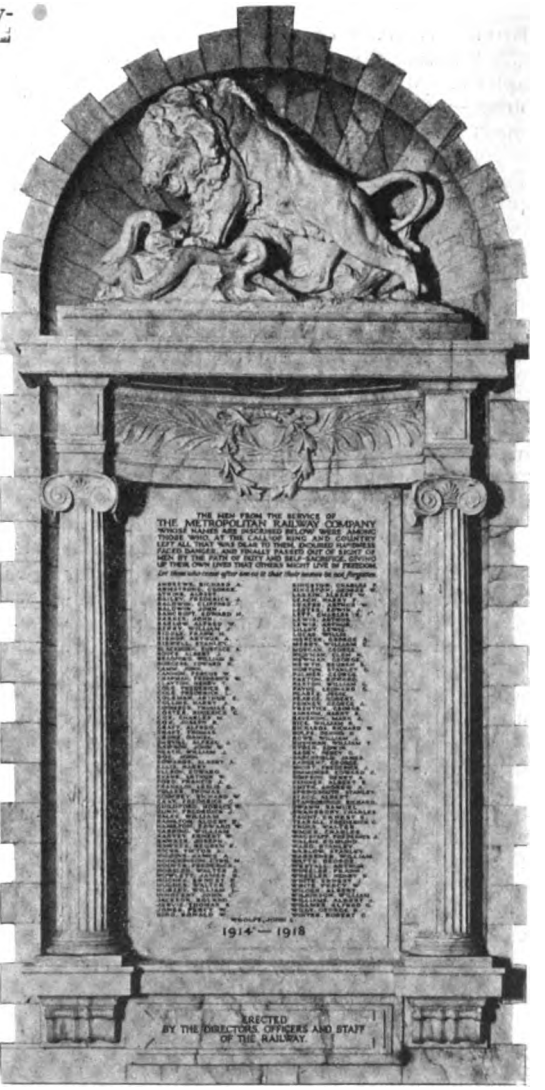
COINCIDING appropriately with England's greatest anniversary, a memorial perpetuating the memory of the fallen members of the Metropolitan Railway Staff was unveiled at Baker Street Station on Thursday, November 11, in the presence of a large gathering of directors, officers and staff, including also a number of widows and relatives. The memorial, executed in white Carrara marble and occupying an arresting position facing the Station's busiest platform, is of singular beauty, and takes the form of a mural monument with Grecian columns and entablature, and is surmounted by a striking allegorical group in which the lion predominates, whilst the Roll of Honour, incorporated in the Memorial, records the names of 137 men from the Company's service who gave their lives to the country. A further point of interest in connection with the memorial is that it was designed by a member of the Metropolitan Railway staff, while the decorative rail protecting same was made in the Company's workshops at Neasden.

THE buffer-stop collision at Cambridge, on which Major Mount has recently reported, was not a case of bad judgment by a driver, nor of too high a speed, nor of brake failure, but was due to the signalman "taking away the road" from the driver. The latter had to enter the main platform line and all the signals corresponding were lowered. The signalman, when he heard the driver give the customary long warning whistle, thought he heard the three whistles that were the code for the London & North Western bay. The man was having his breakfast at the time, and he proceeded to alter the road to divert the train off the main line,



METROPOLITAN RAILWAY WAR MEMORIAL AT BAKER STREET STATION.

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At the time the driver passed under Hills Road bridge the train was travelling at about 20 m.p.h., and it was not until he was through the bridge that he saw that the signals had been changed, and that he would be turned into the London & North Western bay. His train consisted of 11 vehicles, seven of which were six-wheeled, and weighed exclusive of the engine, 198 tons 6 cwt.; the engine weighed 101¼ tons. The Westinghouse brake acted well to reduce the speed to 5 m.p.h. in the 350 or so yards. The driver and his fireman acted with promptness and coolness. All trains for the London & North Western bay are now "belled" on the block instruments.

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NOTICE is given of an application to the Light Railway Commissioners by Sir Harry Stapleton Mainwaring, Bt., Mr. A. D. Holmes, and the Essex Light Railway and Property Company, Limited, to authorise the company to construct a light railway 13¼ miles in length from Chipping Ongar to Dunmow. The proposed railway starts from a point 50 yards from the western end of the booking office at Ongar Station (Great Eastern Railway) and terminates close to Dunmow Station.

* * *

THE inaugural meeting of the Scottish Centre of the Institution of Locomotive Engineers has been held in Glasgow. The meeting was largely attended and represented the railway locomotive engineers, the private builders of railway locomotives, carriages and wagons, and representatives of the steel trade and allied firms. The president, Mr. W. Pickersgill, C.B.E., locomotive superintendent, Caledonian Railway, after briefly setting out the objects of the Institution, formally proposed that a centre be established at Glasgow, and Mr. R. H. Whitelegg, chief mechanical engineer, Glasgow and South Western Railway, as chairman of the centre. The proposition was seconded by Mr. J. Keyden, Caledonian Railway, Motherwell, and carried unanimously. Mr. Whitelegg delivered an address and a *résumé* of the Institution from its inception until the present time. The following were nominated and accepted as officers of the centre:—W. Chalmers, North British Railway, Vice-Chairman. Members of Council:—Messrs. H. Reid, North British Locomotive Company; I. Kempt, Caledonian Railway; J. P. Grassick, North British Railway; G. W. Chalmers (Hurst. Nelson and Co.); J. Steele, Jr. (R. Y. Pickering and Co.); A. Campbell, North British Railway; W. H. Moodie, Caledonian Railway; D. Smith, Glasgow and South Western Railway; J. Keyden, Caledonian Railway; and C. Fawcett (Beardmore and Co., Ltd.). Hon. Secretary:—D. G. Cowan, Caledonian Railway, St. Rollox.

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THE London Underground Railways and London General Omnibus Company Operating Department has resumed the series of Efficiency Meetings in the Cinema Hall, L.G.O.C. Training School, Milman's Street, Chelsea. Mr. H. E. Blain, C.B.E., Operating Manager, presided at the first meeting for the session 1920–21. The paper on this occasion, entitled "Some Phases of Transport of the Future," was read by Mr. L. Findlater, Superintendent of Employment, Training and Catering, L.G.O.C., which proved to be exceedingly interesting, and was highly appreciated by over 320 of the supervisory grades who were present. The following were some of the points dealt with by the lecturer:—Era of Speed—Kearney High Speed Railway—Gravity Railways—Mono Rails—Post Office Tube Railway—Transport by Air—Safety—Carrying Capacity—Comfort—Regularity of Service—Cost—Deep Level High Speed Lines.

* * *

THE Second Annual General Meeting, Reunion and Dinner, of the Military Forwarding Services Old Comrades' Association, was held at the Albion Hotel, Manchester, on November 6, when members—most of them railwaymen—attended from all parts of England and Scotland. Mr. C. L. Macdona, O.B.E., the late M.F.O. to the British Expeditionary Force—who is now on railway service in Rhodesia—was elected Honorary President, and Mr. H. M. Lees, President, for the ensuing year. The Committee (Messrs. Pauling, Smith and Conyer) and the Honorary Joint Secretary and Treasurer (Mr. Frank Gilbert) were re-elected, and it was decided to hold the next Reunion in London on the first Saturday in November 1921.

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